DOMESTIC ENGINEERING

Whole No. 973. Vol. LVI. No. 6 443 South Dearborn St., Chicago. August 5, 1911

A Proposed Basis for Rating House Heating Boilers and Furnaces

By Frank L. Busey, M. E.

Read before the Summer Meeting of the American Society of Heating and Ventilating Engineers, July 6, 1911

This Was One of the Most Interesting Papers Presented at that Meeting and Offers Fresh Possibilities for Committee Work Along New Lines. This Boiler-Rating Question is Going to be Solved This Contribution is Another Step Towards its Solution

For small and medium-sized heating installations, steam and hot-water boilers and warm-air furnaces are used for the same class of work, depending on the requirements and available funds. Each has its own advantages and its own advocates, so there should be some common or comparable basis of rating, or of making a comparison of the results to be expected from the various units. This rating should be expressed in some small quantity, in order that it be easily handled and comprehended. It should be, if possible, in some well-known and established term, such as the American Society of Mechanical Engineers' standard horse-power, universally used in referring to large power and heating boilers. Heating installations will usually range between 2 and 50 h. p., where the installation is intended strictly for heating purposes.

The question of a fair and proper rating for house-heating apparatus has often been discussed, without definite results, and the need of a solution to the problem is sorely felt by all who come in contact with the boiler and furnace business. Some manufacturers are equipped to test their boilers properly, and so arrive at a fairly accurate determination of what performance their product is capable. On the other hand, a considerable number of builders have no adequate means of conducting tests and would be unable to interpret the results in case such tests were made. These are the parties who are guilty of placing apparatus on the market which has a catalog rating of two to three times what can be developed under normal working conditions. As a result, the business is in an unsatisfactory state as regards ratings, and the crying need of the trade is for some uniform system whereby the heating capacities of the various types of boilers and furnaces may be closely approximated from the design and dimensions of the unit under consideration.

An appreciation of this need has led the writer to turn his attention to the rating question, with the result that a number of interesting conclusions have been derived. These results will be presented herewith, together with the methods by which they were obtained. A study was made of several hundred tests made by the University of Illinois Engineering Experiment Station on various types and sizes of small boilers and furnaces, and also of tests made on other and larger units, the results of which could be relied upon.

The practice of using 10 or 12 sq. ft. of heating surface in a boiler as equivalent to one horsepower is hardly warranted in house-heating boiler work, since the rate of combustion, ratio of heating surface to grate area and consequent variation in efficiency may invalidate such a system. As a matter of fact, the amount of surface required may vary anywhere from 5 to 50 sq. ft. per horsepower, depending on the conditions mentioned.

Various forms and combinations were tried and discarded, and it was finally decided to use the term horsepower as the unit of heating effect, as applicable to both steam boilers and warm-air heaters. Taking the A. S. M. E. standard of 34.5 lb. of water evaporated per hour from and at 212 deg. F. as equivalent to one boiler horsepower, we have $34.5 \times 970.4 = 33{,}479$ B. t. u. as also equal to one horsepower. In the case of the boilers, the equivalent evaporation from and at 212 deg. F. per hour divided by 34.5 gives the horsepower developed. With the warm air furnaces the pounds of air heated per hour multiplied by the rise in temperature and the specific heat of air, gives the number of B. t. u. delivered per hour to the air. This in turn divided by 33,479 gives the horsepower developed by the furnaces.

Having determined the total horse-power developed by the various units tested, the next step was to find some dimensions, relation, or ratio to which the horsepower developed could be referred, and so obtain a unit to which the horsepower would bear some definite relation. It was found

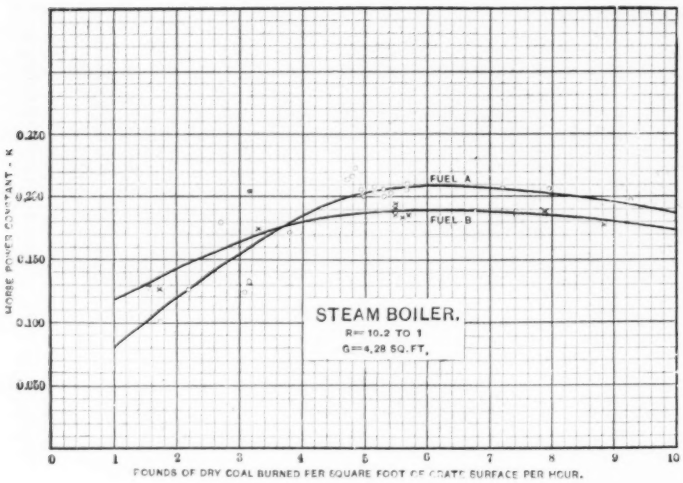


Fig. 1. Relation of Horse-Power Constant to Rate of Combustion.

that the horsepower developed upon each square foot of grate by one pound of dry fuel burned per hour on each square foot of grate surface was remarkably constant. This is true for any one boiler or furnace when burning dry coal per square foot of grate per hour between the limits of 4 to 8 lb. for small units and 5 to 10 lb. for the large units, and when using coals of a similar quality. This is shown very clearly in Figs. 1 and 2 for two separate units, each using two classes of fuel. This value, termed a horsepower constant, and designated by the letter K, was obtained for each test analyzed, by dividing the horsepower developed by the grate area, and this quantity in turn by the rate of combustion. Since frequent reference will be made to the grate area and the rate of combustion for any one heating unit, these terms will be designated by the letters G and F, respectively.

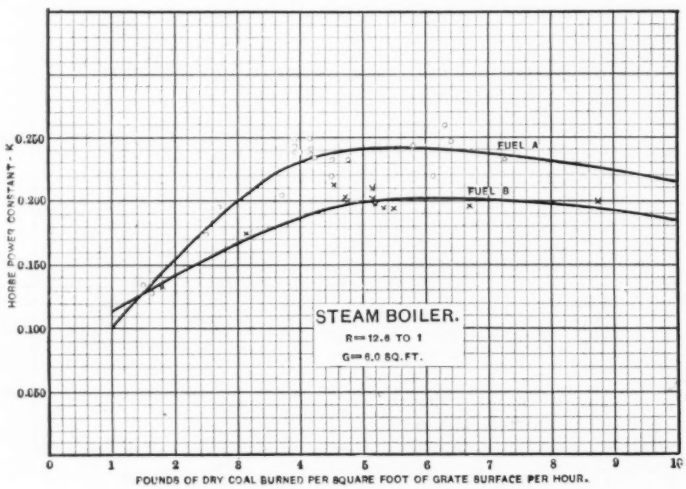


Fig. 2. Relation of Horse-Power Constant to Rate of Combustion.

While K was constant for any one unit and for a similar quality of coal, yet different units gave different values of K. It was found that the higher values of K were obtained from units having a greater number of square feet of heating surface for each square foot of grate, this number being the ratio of the total square feet of heating surface to the square feet of grate. This ratio will be designated by the letter R. For a similar quality of coal, the values of K from the different units were then plotted to the corresponding values of R, as shown in Fig. 3. It is seen that there exists a very definite relation between the values of K and R.

This relation appears reasonable, for, other conditions being equal, higher efficiencies will be obtained with higher values of R. Thus in practice it is customary to use additional sections, resulting in higher values of R, and also greater capacity. The relation between K and R was found to be independent of the size of the unit tested, inasmuch as increase in size is usually accompanied by an increasing value of R. This accounts for the higher efficiencies obtained from large units.

It is well known that the use of various grades of coal results in different efficiencies in the same unit. From a study of the tests made it was found that the coals used could be divided into three general classes, designated as classes A, B and C. Class A includes anthracite, coke and semi-bituminous coals. Class B includes good grades of bituminous coal, such as is mined in Williamson, Franklin and Saline counties of the southern district of Illinois. Class C includes the poorer grades of bituminous coal. We have already seen that when using any one class of coal a definite relation exists between K and R. Although different values of K are obtained when using the different classes of coal, yet each class has its own definite relation between K and R. This is well illustrated in Fig. 3, where the three curves refer to the different classes of fuel.

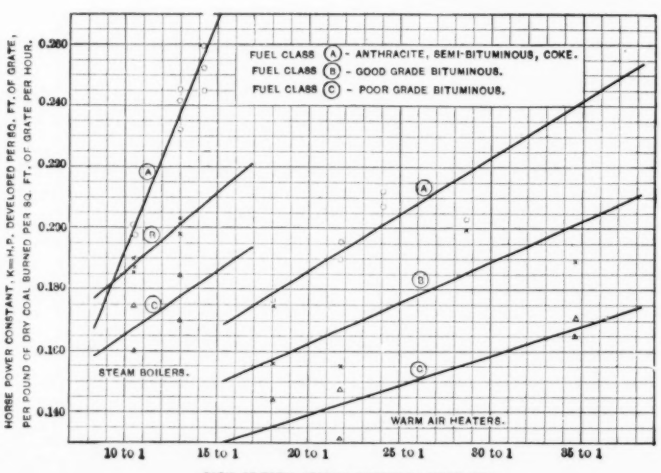

HORSE POWER CONSTANT, K=H.P. DEVELOPED PER SQ. FT. OF GRATE, PER POUND OF DRY COAL BURNED PER SQ. FT. OF GRATE PER HOUR.
0.260
0.240
0.220
0.200
0.180
0.160
0.140
FUEL CLASS (A) - ANTHRACITE, SEMI-BITUMINOUS, COKE.
FUEL CLASS (B) - GOOD GRADE BITUMINOUS.
FUEL CLASS (C) - POOR GRADE BITUMINOUS.
STEAM BOILERS.
WARM AIR HEATERS.
10 to 1
15 to 1
20 to 1
25 to 1
30 to 1
35 to 1
RATIO OF TOTAL HEATING SURFACE TO GRATE AREA.

Fig. 3. Relation of Horse-Power Constant to Rates of Heating Surface to Grate-Area.

Table 4 shows the average proximate analyses of the three classes of coals as they were used during these tests. The term "good" or "poor," as here used, refers to the performance of the coal when used in small house heating units and not for large power boilers. The comparatively low furnace temperatures attained in the smaller furnaces make it impossible to burn completely the excessive amounts of volatile matter contained in these coals designated as "poor bituminous." For this reason they soot up the flues and cut down the efficiency.

It is customary in order to get the same heating effect, to build warm-air furnaces with a much greater value of R than is used with steam and hot water boilers. This is on account of the fact that more heat can be transmitted through one square foot of heating surface to water than to air. Tests show that in warm-air furnaces R must be from two to three times as large as in boilers to give the same efficiency, and corresponds very closely with practice.

As a result of these facts, K does not bear the same relation to R in furnaces as in boilers, due to the greater value of R necessary in furnaces to obtain the same value of K. It follows that the relation of K to R varies, not only with the different class of fuels used, but with the different type of heating unit, being clearly shown in Fig 3.

Fig. 3 shows the relation between the horse power constant K and the ratio of total heating surface to grate area R. The general relation of the curves A, B and C for furnaces and curves B and C for boilers is seen to be very similar, the better fuels giving the higher efficiencies. This difference increases slightly as the value of R increases. An increase in the value of R is accompanied by an increase in the value of K only in so far as the value of R is confined to the limits found in practice. These limiting values of R for boilers in which this relation was found to hold are between 8 and 15. This range for furnaces, however, is from 15 to 38. It is quite probable that the higher value of 15 set for R in the case of boilers can be increased to 20 or even above, but it was impossible to obtain sufficient data to prove absolutely this point. Nevertheless the indications are that this is the case.There would eventually come a point where the temperature of the flue gases would be reduced to so nearly the temperature of the surrounding water or air that no further gain would be effected by increasing the radiating surface.

Curve A, in the case of the boilers, shows a much greater difference in favor of the high carbon over the bituminous coals as the radiating surface is increased. This difference is probably due to the comparatively restricted flue passages as ordinarily used in steam and hot water boilers, in which the soot from the bituminous coals tends to deposit and so cut down the efficiency. In warm-air heaters the radiator is usually made of such ample proportions that less difficulty is experienced with soot deposits. If the ratio of heating surface to grate could be increased, and at the same time the gas passages kept of ample size, curves B and C would no doubt tend to assume an inclination more nearly like that of curve A.

It is evident that an increase in the radiating surface of boilers is productive of greater gain in efficiency when using Class A fuels rather than the ordinary bituminous coals. With boilers having a low value of R a good grade of bituminous coal may be expected to give as good results as are to be obtained with anthracite or eastern semi-bituminous coals.

Having found that the values plotted in Fig. 3 can be represented by straight lines within the limits of the tests used, the next step was to derive a formula and determine the proper constants applicable to the various sets of conditions.

Let G = Area of grate surface in sq. ft.
F = Pounds of dry fuel burned per sq. ft. of grate surface per hour.
R = Ratio of total heating surface to grate area.
K = Horse power constant = h. p. developed per sq. ft. of grate, per lb. of dry fuel burned per sq. ft. of grate per hour.
hp. = Total horse power developed.
C_1 and C_2 = constants for any one set of conditions.

It will be noticed tht the average deviation of the points from the lines as drawn is less than 3 per cent., and that the maximum deviation is 7.5 per cent. This shows how closely actual performance, as shown by a study of several hundred tests, may be approximated by the use of the formulae and constants given in Table I.

TABLE 1.—VALUES OF C_1 AND C_2 FOR THE FORMULA $K = C_1R + C_2$

	Fuel	C_1	C_2
Steam Boilers	Class A—Anthracite, Semi-bituminous, Coke	0.0150	0.046
	" B—Good Grade Bituminous	0.0052	0.135
	" C—Poor Grade Bituminous	0.0041	0.126
Warm Air Heaters	Class A—Anthracite, Semi-bituminous, Coke	0.0037	0.112
	" B—Good Grade Bituminous	0.002	0.110
	" C—Poor Grade Bituminous	0.0020	0.101

Then these lines are represented by a formula of a form.

$$K = C_1R + C_2 \ldots\ldots\ldots\ldots\ldots\ldots (a)$$

In this formula C_1 and C_2 have definite values for any one set of conditions—that is, for one type of heating unit in varoius sizes, when using one class of coal.

The various sets of values for C_1 and C_2 have been carefully determined and are tabulated in Table I. Thus the formula for warm-air heaters for a fuel in class A becomes

$$K = 0.0037R + 0.112$$

For any unit under consideration this formula gives us the value of K, or the horsepower that is developed on each square foot of grate surface by each pound of fuel burned per square foot of grate per hour. Knowing K, the grate area, and the most desirable rate of combustion, the total horsepower developed can be readily determined by the formula.

$$\text{hp.} = K \times G \times F \ldots\ldots\ldots\ldots (b)$$

The A. S. M. E. standard of 34.5 lb. of water evaporated as one horse power was used, hence 1 hp. = 33,479 B.t.u. This in turn divided by 250 gives the number of square feet

TABLE 2.—VALUES OF HORSE-POWER CONSTANT K FOR VARIOUS VALUES OF RATIO R, STEAM BOILERS

R Ratio of Total Heating Surface to Grate Area	Fuel A			Fuel B			Fuel C		
	K Horse Power Constant	B.t.u. per Hour Delivered to the Water	Square Feet of Radiation Served	K Horse Power Constant	B.t.u. per Hour Delivered to the Water	Square Feet of Radiation Served	K Horse Power Constant	B.t.u. per Hour Delivered to the Water	Square Feet of Radiation Served
8 to 1	0.166	5560	22.2	0.177	5925	23.7	0.159	5320	21.3
9 "	0.181	6060	24.2	0.182	6090	24.4	0.163	5455	21.8
10 "	0.196	6560	26.2	0.187	6260	25.0	0.167	5590	22.4
11 "	0.211	7065	28.3	0.192	6430	25.7	0.171	5730	22.9
12 "	0.226	7565	30.3	0.197	6595	26.4	0.175	5865	23.5
13 "	0.241	8065	32.3	0.203	6785	27.1	0.179	6000	24.0
14 "	0.256	8570	34.3	0.208	6960	27.8	0.183	6135	24.5
15 "	0.271	9070	36.3	0.213	7130	28.5	0.188	6280	25.1
16 "	0.286	9575	38.3	0.218	7300	29.2	0.192	6420	25.7
17 "	0.301	10075	40.3	0.223	7465	29.9	0.196	6550	26.2
18 "	0.316	10575	42.3	0.229	7665	30.7	0.200	6690	26.8
19 "	0.331	11080	44.3	0.234	7835	31.3	0.204	6830	27.3
20 "	0.346	11580	46.3	0.239	8000	32.0	0.208	6965	27.9

of direct radiating surface carried—taking the standard of 250 B.t.u. emitted per square foot per hour. With warm-air furnaces the B.t.u. delivered to the air per hour divided by 1.4356 (the heat required to raise 1 cu. ft. of air from zero to 70 deg. F.) gives the equivalent cubic feet of air heated from 0 deg. to 70 deg. F.

As previously explained, the value of K, of the B.t.u., or of the heating effect, as given in Tables 2 and 3, when mul-

tiplied by G and F give the total horsepower developed, total B.t.u. delivered, or total heating effect, under the conditions assumed. Fig. 4 for boilers and Fig 5 for furnaces have been drawn to show more clearly the effect of the various combinations of the factors already discussed. From these figures can be readily traced the entire course from heat unit to the horsepower developed for any set of conditions.

will follow the vertical line upward from the point where $R = 12.5$ until we intersect the line A. From this intersection we follow the horizontal line to the left through the point $K = 0.235$ until we intersect the line $G = 6$. From this point we trace the vertical line upward until we reach the line $F = 6$. Following the horizontal line to the right from this point it is seen that under these conditions the horsepower developed is 8.5. On tracing it farther to the

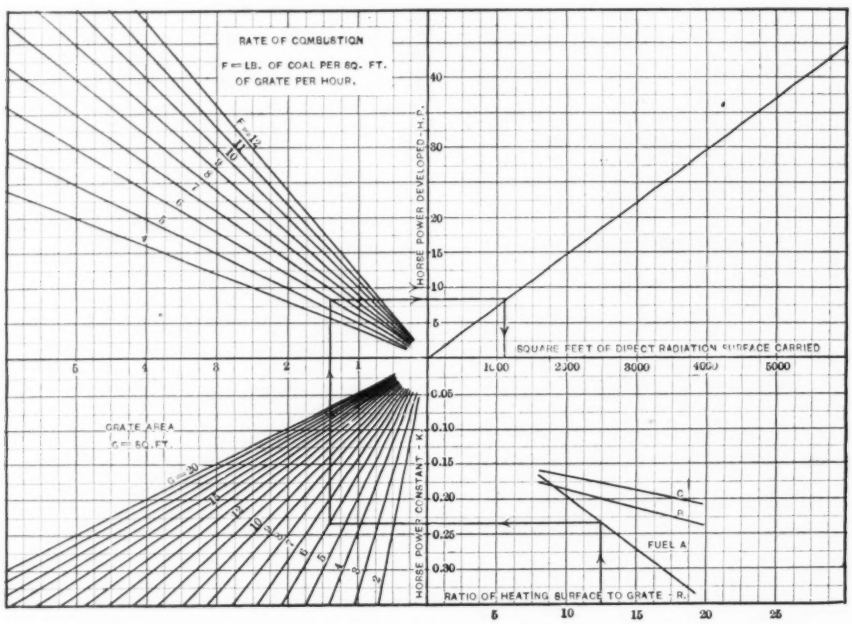

RATE OF COMBUSTION
F = LB. OF COAL PER SQ. FT. OF GRATE PER HOUR.
HORSE POWER DEVELOPED - H.P.
SQUARE FEET OF DIRECT RADIATION SURFACE CARRIED
GRATE AREA G = SQ. FT.
HORSE POWER CONSTANT - K
FUEL A
RATIO OF HEATING SURFACE TO GRATE - R.

Fig. 4. Diagram of Horse-Power Developed and Load Carried by Various Sizes of Boilers.

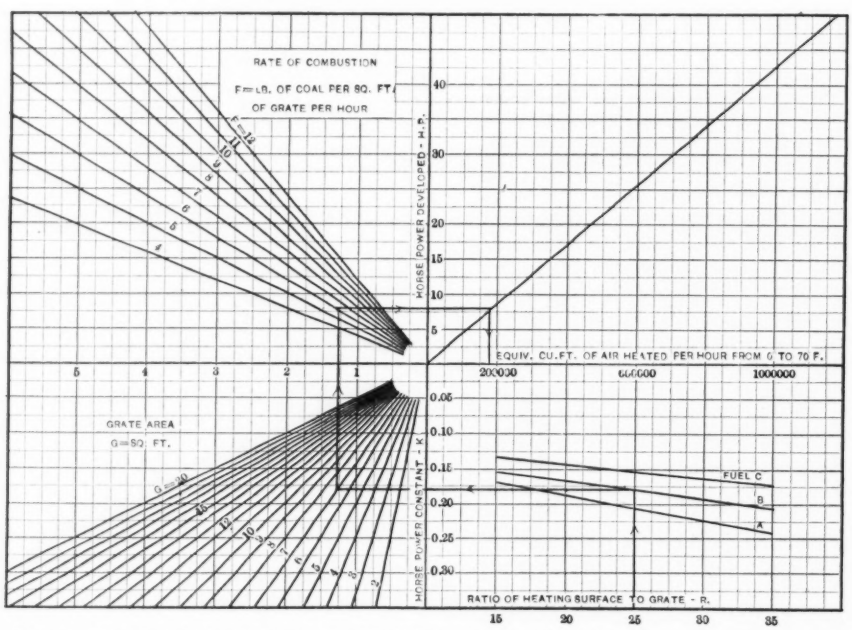

RATE OF COMBUSTION
F = LB. OF COAL PER SQ. FT. OF GRATE PER HOUR
HORSE POWER DEVELOPED - H.P.
EQUIV. CU.FT. OF AIR HEATED PER HOUR FROM 0 TO 70 F.
GRATE AREA G = SQ. FT.
HORSE POWER CONSTANT - K
FUEL C
RATIO OF HEATING SURFACE TO GRATE - R.

Fig. 5. Diagram of Horse-Power Developed and Load Carried by Various Sizes of Furnaces.

Referring to Fig. 4 let us assume a boiler with a value of $R = 12.5$, a grate area of 6 sq. ft. and a rate of combustion of $F = 6$ lb. Then if we are to use anthracite, we

right until we intersect the diagonal line, then dropping downward on the vertical line we find the equivalent heating surface served to be 1,150 sq. ft.

In the same manner for warm-air furnaces on Fig. 5, the values can be traced as shown. From $R = 25$, fuel B, $G = 7$, $F = 6$, to 7.8 hp. or a heating effect of 180,000 cu. ft. of air warmed per hour from 0 deg. to 70 deg. F.

TABLE 3.—VALUES OF HORSE-POWER CONSTANT K FOR VARIOUS VALUES OF RATIO R, WARM AIR HEATERS

R Ratio of Total Heating Surface to Grate Area	Fuel A			Fuel B			Fuel C		
	K Horse Power Constant	B.t.u. per Hour Delivered to the Air	Equivalent Cu. Ft. of Air Heated per Hour from 0° to 70°F.	K Horse Power Constant	B.t.u. per Hour Delivered to the Air	Equivalent Cu. Ft. of Air Heated per Hour from 0° to 70°F	K Horse Power Constant	B.t.u. per Hour Delivered to the Air	Equivalent Cu. Ft. of Air Heated per Hr. from 0° to 70°F.
15 to 1	0.168	5610	3906	0.151	5040	3511	0.131	4385	3054
16 "	0.171	5730	3993	0.153	5130	3573	0.133	4455	3103
17 "	0.175	5855	4078	0.156	5220	3636	0.135	4520	3148
18 "	0.179	5980	4165	0.159	5310	3699	0.137	4585	3194
19 "	0.182	6105	4251	0.161	5400	3761	0.139	4655	3243
20 "	0.186	6225	4338	0.164	5490	3824	0.141	4720	3288
21 "	0.190	6350	4424	0.167	5580	3887	0.143	4785	3333
22 "	0.193	6475	4510	0.169	5670	3950	0.145	4855	3382
23 "	0.197	6600	4597	0.172	5760	4012	0.147	4920	3427
24 "	0.201	6725	4683	0.175	5850	4075	0.149	4990	3476
25 "	0.205	6845	4769	0.178	5940	4138	0.151	5055	3521
26 "	0.208	6970	4855	0.180	6035	4204	0.153	5120	3566
27 "	0.212	7095	4942	0.183	6125	4266	0.155	5190	3615
28 "	0.216	7220	5028	0.186	6215	4329	0.157	5255	3660
29 "	0.219	7340	5114	0.188	6305	4392	0.159	5325	3709
30 "	0.223	7465	5201	0.191	6395	4455	0.161	5390	3754
31 "	0.227	7590	5287	0.194	6485	4517	0.163	5455	3800
32 "	0.230	7715	5373	0.196	6575	4580	0.165	5525	3849
33 "	0.234	7835	5459	0.199	6665	4643	0.167	5590	3894
34 "	0.238	7960	5545	0.202	6755	4705	0.169	5660	3943
35 "	0.242	8085	5632	0.205	6845	4768	0.171	5725	3988
36 "	0.246	8210	5718	0.208	6935	4831	0.173	5795	4034

This operation can be reversed with either Fig. 4 or 5, thus working from the amount of heat needed back to the unit to be selected.

Conclusions.

(*a*) Any basis of rating selected for heating installations should be equally applicable to steam and hot water boilers and to warm-air furnaces, as they are used for similar requirements.

(*b*) A unit of rating should be of such a character that it may be easily expressed and comprehended, of some standard form that may be compared to that used for power-boiler rating.

TABLE 4.—AVERAGE PROXIMATE ANALYSIS OF FUELS USED, FUEL AS FIRED

	Fixed Carbon Per cent.	Volatile Per cent	Moisture Per cent.	Ash Per cent.	Sulphur Per cent.	B.t.u. Per lb.
Class A—Anthracite	78.25	7.13	3.49	11.15	1.30	12820
Coke	80.50	3.26	6.30	9.94	0.90	12015
Semi-bituminous	74.37	18.79	1.49	5.15	0.74	14780
Class B—Bituminous	49.07	34.91	6.84	9.19	1.82	12250
Class C—Bituminous	41.59	38.05	10.79	9.57	2.97	11340

(*c*) The term horse power as used in the A. S. M. E. rating for power boilers is a measure of heat delivered, is applicable to both boilers and furnaces, and fulfills better than any other term the above requirements.

(*d*) The heat generated, or the power developed, on each square foot of grate by the combustion of one pound of fuel on that square foot of grate, has been found to be practically a constant, under the conditions as already outlined. This is true of both boilers and furnaces.

(*e*) This constant bears a definite relation to the size of the heating unit, as expressed by the ratio of its total heating surface to grate area. Based on the results of actual tests, this relation can be expressed by a simple formula and the above constant determined for different units and sets of conditions.

(*f*) The difference between the horse power developed by actual test and that calculated by the use of this formula is comparatively slight. The calculated horse power may be used in connection with the ordinary heating job, with entire satisfaction.

(*g*) The use of the diagrams Fig. 4 and 5 will expedite the work of calculation, and for any ordinary case is sufficiently accurate. Where greater accuracy is desired the formulae (*a*) and (*b*) and the values of C_1 and C_2 from Table I may be used.

PROFESSOR HOFFMAN GOES TO NEBRASKA.

James D. Hoffman, professor of mechanical engineering at Purdue University, Lafayette, Ind., has just been appointed head of the engineering department of the University of Nebraska at Lincoln, Neb. Professor Hoffman is well known in the heating and ventilating profession and is a past president of the American Society of Heating and Ventilating Engineers. He is receiving congratulations from his many friends on his call to the larger work he will undertake at the University of Nebraska.

LIST OF STANDING COMMITTEES OF THE NATIONAL MASTER PLUMBERS' ASSOCIATION OF THE UNITED STATES.

National President Eynon has announced the following list of appointments for the coming year. It is certainly a strong combination of efficient men and doubtless much important work will be accomplished this year, and the reports will add to the glory of the next convention at Salt Lake City:

Essay Committee: Chairman, Andrew F. Curtin, Medford, Mass.; J. C. Hamilton, 160 W. 3rd St., Tulsa, Okla.; Jno. G. Roland, 1420 E. Madison St., Seattle, Wash.; Ambrose Clayton, Davenport, Ia.; F. C. Phillips, Lincoln, Nebr.

Sanitary Committee: Chairman, Carl J. Stein, 479 State St., Chicago; Edw. H. Morgan, 3080 Reading Road, Cincinnati, O.; S. S. White, Pittsburgh, Pa.; George E. Robinson, Galveston, Tex.; Thos. J. Tierney, 494 Westminister St., Providence, R. I.

Legislative Committee: Chairman, John H. Moran, 119 State St., Albany, N. Y.; L. L. Lord, Meadville, Pa.; G. F. Reeke, Green Bay, Wis.; A. P. Elder, 208 Main St., Ottawa, Kans.; C. H. Maloney, Gary, Ind.

MASTER PLUMBERS HAVE ANNUAL OUTING.

The master plumbers of Salt Lake and Ogden, 150 in number, enjoyed an outing at the Hermitage on July 15th at Ogden. The Salt Lake delegation, 110 strong, arrived about 4 o'clock and proceeded at once to Ogden canyon.

Games and races were enjoyed until six o'clock, when a banquet was served, Charles Higson being toastmaster. The slogan of the gathering was "No hatchets to bury," the plumbers of Salt Lake and Ogden declaring that only the friendliest feeling existed between them and always had.

Toasts were responded to by James Macbeth, president of the Ogden Master Plumbers' association; President Green of the state association from Salt Lake, Joseph Livingston of Salt Lake and others.

"There are four things that come not back—The Spoken Word, The Sped Arrow, The Past Life, and The Neglected Opportunity."

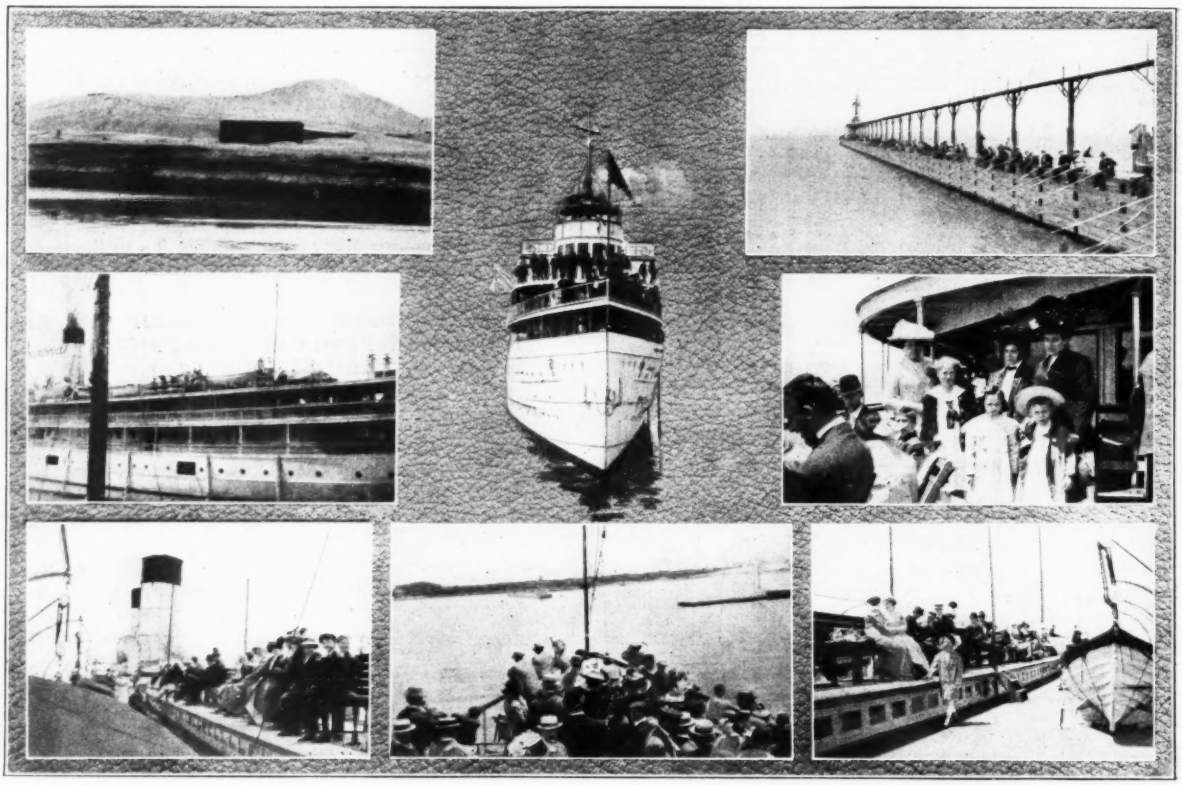
Be careful of the first; dodge the second; forget the third; don't allow the fourth to happen.

Annual Picnic of Chicago Master Plumbers a Joyous Event

In one of our European contemporaries, we read "The Coronation of the King passed off with great eclat." What's good enough for a king is none too good for master plumbers, so we will amplify that well-sounding sentence and state that the annual outing of the Chicago master plumbers eclatted all the time from start to finish. (We reserve copyright on "eclatted.")

On July 24th and 25th the meteorological experts of the Chicago Association trembled in their "brogans" for fear the prevailing bad weather would continue. The Committee of Arrangements and Entertainment, however, knew its plans for perfect weather were carefully laid. The date had been selected by astrological calculation and Venus, Cupid and Mercury being in ascendant quadrangulation, Mars and pas were determined to go anyhow.

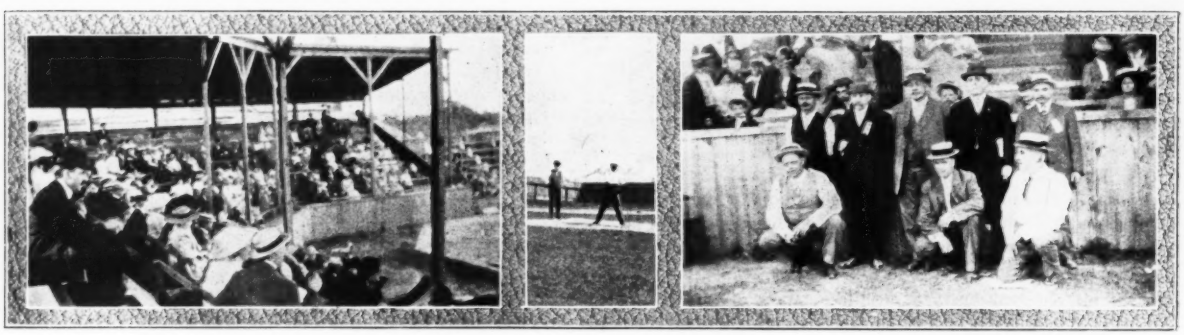
Wednesday, July 26th, justified all propñecies. The "Theodore Roosevelt" was the favored vessel and the expedition left the Clark St. bridge at 10 a. m. Green slips were distributed to every boarder of the Teddy R., advertising prizes for the best waltzing couple ($5.00), the nearest guess to the number of master plumbers aboard, ($5.00), and for the discovery of a mysterious stranger ($10.00).



Michigan Sand-Dunes.
Fire-Drill.
Upper-Deck Ozonists.

The "Theodore Roosevelt."
Approaching Michigan City.

The Fishing-Pier.
Mrs. Bahn and Party.
No Sea-Legs Were Necessary.



Three Snap-Shots of Fans and Players.

During the voyage, groups visited groups; some spliced the main brace but none got three sheets in the wind. The ladies discussed domestic economy a la tutti frutti and "hard times come again no more" a la ice-cream cone. The youngsters played, billed or cooed or both, according to there ages and sexes. The older men reminisced of the early plumbing days; the younger ones told of contracts won, lost and hoped for.

At one bell in the afternoon watch, Michigan City was invaded. Great surprise was expressed by some that the Chicagoese and Michiganderian dialects differed so little. Everybody surrounded his, her or its noon-day meal according to his, her or its particular fancy. Several tremendous lunch-baskets were seen strolling to the beach, apparently supported only by two nether limbs, no other locomoto-supporting apparatus being visible! Some of the picknickers mounted the sand-dunes, reasoning that provisions should be abundant because of the sandwiches there. (Eve enjoyed this joke immensely). Other parties purchased their gastronomical fuel at the leading restaurants and hotels, the Vreeland Hotel being, it was declared "recherche, tout au fait and cafe au lait."

At two o'clock all traveling was done to one central point—the baseball park, where the final battle for the cup was to be fought out between the North and North-West-Side plumbers and the South-Side pipe-experts. The line-up was as follows:

South Side.	N. & N. W. Side.
C. V. Riley rf.	F. Grosch rf.
J. C. Ladd lf.	L. Nelson lf.
C. F. Taffe cf.	E. C. Wagner cf.
Jos. Killeen 1b.	W. Gawne 1b.
J. A. Goodbrand 2b.	P. K. Clayton 2b.
D. E. Kinsella 3b.	G. Lillig 3b.
Wm. Hanrahan ss.	W. Baker ss.
J. J. Flairn p.	R. Arnold p.
W. Boyd c.	Chas. Stein c.

Umpire—Hugh Ryan.

The Plumbers in Base-Ball Turmoils. The Camera Caught the Ball on Its Way to the Plate. You Can See It at the left.

N. and N. W. Side. The Two Base-Ball Teams. South Side.

The south-siders led off and stayed led. Miraculous curves left the pitchers' hands; the willows agitated the air so as to gently fan the grandstand spectators; several amazing zoological stunts were pulled off by the fielders. Many walked and more ran. Just before four o'clock the umpire cried "Hold Enough" as it was decided the

game should end by four if not before. The South-Side team was victorious, the score being 9 to 0.

At 4:20 p. m. the return journey began, the ingoing passage being even more pleasant than the morning trip. Harry Snow, of the Peerless Selling Co., Evansville, Ind., was awarded the $5.00 for guessing nearest to the number of master plumbers on board. He guessed 507 and there were 506. He must have been counting them as they walked the gang-planks. Anyway, it was a sure-enough close guess.

The judges of the waltzing contest had to work overtime. Messrs. Hanrahan, Lang and Knauss made the terpsichorean diagnosis. It was a hard thing for them to agree upon the waltzing essentials. Brother Hanrahan contented that the patella should be the point of determination as it is often held too stiff. Expert Lang poohpoohed the mention of the sesamoid bone and maintained that no expert waltzer could be declared such unless the ulna was at right angles to the humerus. A compromise was finally effected through the mediation of Judge Knauss and the prize was awarded to Miss Linda Bahn because of her skillful maniputation of tarsus and metatarsus and to V. M. Gasper for rhythmic accompaniment to the orchestral vibrations. The judges then retired to be treated for opthalmotropia.

The mysterious stranger was not found but it is reported that he was a Mr. Renich, a friend of several of the plumbers on board.

The plumbing and heating supply-trade was well represented as will be seen by the following list:

Wolff Mfg. Co.—F. D. Gassmere, C. Loges, Gus. F. Vodicka, A. Jones, E. W. Fisher, C. A. Parry, A. W. Wolff, W. O. Buckley. C. N. Marcellus Co.—C. N. Marcellus. Peerless Selling Co.—H. F. Weaver, Harry Snow. Kewanee Boiler Co.—A. W. Magill. Weil Bros.—I. Weil. Wagner Plumbing Supply Co.—Fred J. Wagner. Federal-Huber Co.—O. D. Peck, Frank Grier. Wolverine Brass Co.—O. W. Meusel, G. A. Abbott. Raymond Lead Co.—Fred F. Hofmann, H. F. Straus, W. W. Keyes. McCrum-Howell Co.—W. J. Tanyan, A. E. Heintz. Kellogg-Mackay Co.—O. S. Lippman. Whitney & Ford.—H. E. Whitney, A. R. Lockie, A. Curtis, L. W. Rademacher. National Plumbing & Heating Supply Co.—F. Garrity, S. M. Murdoch. James B. Clow & Sons.—V. M. Gaspar H. Chichester, John Coyle, T. R. Seabrooke. United Brass Co.—C. L. Botley. Wm. Cohen and D. Rolnick, purchasers of metal scrap.

The Committee on Arrangements and Entertainment was composed of the following: E. C. Wagner, Chairman; A. Morrison, F. W. Kiesgen, Wm. Gawne, Jas. Kaplin, Wm. Hanrahan, F. J. Dillenburg, P. J. Foley, J. C. Naughton, J. I. Elliott, B. E. Lyman, Louis Nelson, Chas. Dreier, Peter Munn, Wm. J. Lang, Wm. Redieske, Stanley Loula, John Clifford, L. A. Clausen, Peter Feltman, A. W. Bahn, Fred Grosch, Chas. Mundt, D. J. Berry, Mat. Mandable, W. A. Bunge, C. J. Stein, E. J. Benning.

There were no casualties during the day. The trip terminated at 7 p. m. and every one was happy. Some arms were linked on the return journey that were only introduced at the start. Evidently lessons had been given in the tying of lovers' knots. Trips of this kind go far to cementing friendships among members of the trade. Some of the old-timers were not there. They should have been. The younger men are always glad to shake the hands of those who have paved the way for their present commercial successful efforts and who have helped build up public desire for municipal sanitation.

On Our Right We See a Necessary Advertisement. How Stern Some Girls Can Be.

Below, on the Left, Thos. Conlin; on the Right, O. D. Peck, both in Rooting Expectancy.

Above, Kindly Note John B. Kerr, for Many Years Inspector in Chicago's Sewer Department.

The Basket Contains Rose Tuelp and Elizabeth Colling, Both Well-Known to the Trade, and Each Capable of Figuring a Skyscraper Job.

A Page for a Chapter on Plumbing and Heating*

By J. J. Cosgrove

Every person owes something to the calling which has given him a living during the greater part of his life, and in no better way can that debt be paid than by trying to add something to the sum total of the knowledge of the craft which will leave it better off than before. It is recognition of this fact which has led me to accept the invitation of the chairman of your committee on papers, and thereby to cancel my debt to the plumbing and heating trades, by calling attention to certain principles of construction which have been half realized, but never fully understood before. I claim no credit for the facts I am about to lay before you, other than having collected and assembled them in their proper order. My attention would probably never have been attracted to the problem had it not been for hundreds of letters from architects, in all parts of the country, asking for assistance, which put up to me the study of the various movements in buildings. Having in the course of that study unearthed many facts of interest and importance, I herewith unburden myself of them to you, as the ones most vitally interested, that your association may publish in your proceedings, and pass on by word of mouth, the new element to be considered hereafter in all plumbing and heating installations.

It was Caleb W. Durham, C. E., so far as I can find out, who first realized the necessity for installing the drainage system so it would be free and independent of all structural parts of the building. The Durham system, now modified and known as the wrought pipe system of drainage, we still have in practice, but the principal feature of that system of installation was never fully realized. To most of us the recessed drainage fittings were the principal elements of the letters patent Mr. Durham took out about 1880. As a matter of fact,, that was but an incident in the system and the principal element which has all these years been overlooked was the supporting of the soil, waste and vent stacks and branches, so that walls and floors could shrink or settle, stacks settle, swing, vibrate or sway, but the plumbing fixtures and their connections would be undamaged. To the inventor of that system of plumbing, the necessity for it was so obvious that he failed to point it out to others. He could not realize that without study or instruction others could not see as clearly as he did, what had come to him as a result of years of patient study and research; so the result is, the good he hoped to accomplish has been deferred for 31 years, and he must now be conceded to have been that much ahead of his time.

Perhaps the principal factor in starting me on a study of the settlement of buildings was a letter received about seven years ago from one of the foremost sanitary engineers in America, Mr. Albert Webster, who, from his large practice in New York preparing plumbing plans and specifications, has had a world of experience in sky-scraper types of buildings. In a personal communication to me he pointed out that while special provision need seldom be made for expansion and contraction of soil, waste and vent stacks, provision should be made to protect them and the fixture-branches from damage from settlements of the buildings or stacks, or shrinkage of the timbers in frame-construction floors. He had seen so many failures in that respect, where 4 and 5-in. branches were broken and closet-connections torn apart, that he was forced to the same conclusion arrived at by Caleb Durham 25 years previously.

About this time scores of letters were received from architects calling my attention to the pulling apart of closet bends, and the breaking of fixture branches, wanting to know the cause, and how to prevent repetitions of the damage. The result of seven years' study called forth by those several incidents I will now give to you, in as brief space as possible, together with suggested preventive measures.

When we look at a large building, rising story above story for 10 to 30 floors, it seems solid as the Rock of Gibraltar. As a matter of fact, however, all heavily-loaded buildings erected settle more or less, generally more, unless their footings have been carried down to bed-rock. In Chicago, there are hundreds and hundreds of buildings which have settled from three in. to five in., due to the compressibility of the soil. Architects and engineers, knowing the danger of damage from settlements, try in all possible ways to provide against it. For instance, the Great Northern Hotel, and a number of others are at the present time, and have been since completion, partially carried on jacks, and are periodically leveled up as settlement occurs. Settlement is such a big factor in tall buildings that it seems strange it should have been overlooked in plumbing and heating design.

Just compare it with the expansion and contraction of steam pipes. A steam riser, 100 ft. long, installed during ordinary weather when the temperature is around 64 deg F., then heated to 215 deg. F., which would represent a pound or so of pressure, would increase in length 1.12 in. All of which is provided for by hanging the riser near the center of its length so it can expand both up and down, thereby keeping the greatest movement of the pipe down to but little over ½-in., and the radiator connections are made with swing joints to allow for such slight movements. But in the same building the entire structure might settle 5 in., or 10 times the movement that takes place in the steam riser, and no provision whatsoever is made for this greater movement, while delicate fixtures of earthenware and porcelain enamel are connected up rigidly without any provision for this settlement, and connected up with pipes many times larger than the flexible pipes used to connect up cast-iron radiators.

The effect of settlement of soil, waste and vent stacks and the preventive measures to adopt have been so well stated by another who has seen the light, Mr. Henry D. McCormack, C. E., in a series of articles he is now running in "Domestic Engineering" under the title of "A Uniform and National Plumbing Code" that I quote freely the following paragraphs from his article:

"So as far as the settlement is concerned, it does not affect the stability of the building so long as the settlement is uniform. But it does affect the piping if not properly supported. Take for example the case of the New York plumbing code, which requires the stacks to start from brick piers located in the cellars. Unless these piers are nicely proportioned to carry exactly the same weight per amount of area as the foundation walls, a condition that is not likely to be carried out, then the building will settle naturally, while the stacks will remain in place supported by the piers, unless forced down by struc-

*Essay presented to the 29th annual convention of the National Association of Master Plumbers, held at Galveston, Tex., June 13-15, 1911.

tural parts of the building pressing on the branches. If the stacks and drains are forced down by pressure of the settling building there is no question but that damage will inevitably result, and in this case as in all others, the ounce of prevention, that is to rough-in and support your pipes so that they will all move uniformly together, or else be entirely independent of each other, is the best plan to pursue, and far better than the pound of cure.

"If the horizontal system of drains in the building is run above the floor-line of the cellar, the stacks can be supported where they turn up by means of strong iron hangers, designed to carry the entire weight of the stack and branches, attached to I-beams overhead. Or when the stacks turn up close to a bearing wall, they can rest on corbels, built into the walls; then when a settlement occurs, the entire system of piping, both horizontal and vertical, will move with the building properly, and when the building finally comes to rest at lower level, the parts will still retain their relative positions.

"The foregoing is only when the settlement of the building is uniform throughout the entire extent of the foundation walls. When the settlement is unequal, as is generally the case, as is attested by cracks of plastered walls and tile flooring in so many buildings, then, while there is a general downward tendency, the movement is not uniform throughout the system. It is to provide for just such contingencies that experienced plumbers on big work provide swing-joints at all floors of the buildings, where batteries of fixtures are to be taken off, and interpose a number of fittings so that when the inevitable settlement occurs, there will be sufficient "spring" or "give" to the piping to take up the movement, without breaking the stacks or fixtures. That is one provision which ought to be taken care of in a plumbing code, and so far as the writer knows is entirely overlooked.

"When the horizontal system of drains is bedded in the earth beneath the cellar-floor, on the other hand, it occupies the same position in respect to settlement as when the stacks are supported on brick or concrete piers. When the settlement of from three in. to five in. occurs, it is the walls, floors and general structure of the building which sinks, while the cellar-floor and the pipes embedded therein retain their original elevations. It is obvious, therefore, that in such a case something must give, or the building could not settle, and in every case it is the soil stacks and branches.

"Another point to consider is the way the stacks are supported along their vertical length. There is only one logical way to do this, and that is to support the stacks at intervals, say at each tier of beams, on rests which will hold the pipe in place, support it from settling, but allow it perfect freedom to move upward if necessary to do so, due to a settlement of the building without a corresponding settlement of the drainage system. Then all the fixture branches should be kept clear of structural parts of the building, and be so roughed-in that as the stacks are raised relative to the building, by a settlement of the walls and floors, the branches would adjust themselves automatically to the new condition of affairs so that no damage would result.

"What we want to require, then, in the new code is a system of supports for the vertical pipes which will hold the stacks firmly sidewise, will not allow them to settle, but will allow them freely to move upward in the hangers. Supports for the horizontal piping in the cellar or basement, when not buried in the ground, which will insure the system of piping and the building settling together, and, where the system of horizontal piping is buried in the ground, a complete detachment from the building walls proper, so that in case of settlement the pipes will simply move upward in their support, at the various floors. Lastly, roughing-in of the branches to batteries of closets and other fixtures in such a manner as to provide for a raising or lowering of the stacks, without damage or injury to the piping or fixtures."

So far we have considered only the effect caused by the settlement of the building itself, when the stacks either retained their original positions or were carried down by the superstructure. There is the opposite condition to be considered, however, where the stacks are insufficiently supported, and settle of their own weight. That such is not unusual in attested by the thousands of cases which have come within my own observation, and as I write, there is laying on my desk before me a letter from H. T. Kilpatrick, St. Louis, Mo., in which he says: "We have lots of trouble here from closet connections pulling apart, and believe your 'Elasto' fittings will effectually prevent this." All of which goes to show that damage from setling soil and waste stacks is not confined to any one city or section of the country. The remedy for this is, of course, not the perfectly rigid heretofore attempted in plumbing construction but on the contrary perfect flexibility, coupled with adequate supports for the stacks. The methods adopted to prevent damage from settlement of the building will be found to afford protection likewise in case of settlement of the stacks. The logical method of attacking the problem would be, of course, to prevent buildings or stacks from settling; but, since that cannot be done, we must recognize and realize the condition which confronts us, and provide flexibility to the system to compensate for the movements when they occur; and this flexibility for plumbing systems is the main element so long lacking and which must be supplied in practice.

Large buildings have only been touched upon so far. Ninety-seven per cent of the buildings erected, however, are of frame floor construction in which wooden joists of from 12 in. to 20 in. are used. These buildings, like the larger ones previously mentioned, all settle, but the settlement in these smaller buildings will average only from one to three in.

But there is another movement which must be taken into consideration in wood floor construction buildings, and that is shrinkage, a not insignificant movement, as you will see.

The Department of Agriculture, Division of Forestry, has been studying the shrinkage of timbers and in Bulletin 10 gives the result of the investigations. From this document I find that the hard pines, tamaracks, yews and other woods, commonly used for floor beams, shrink upon drying 4 per cent. The hard woods shrink more than this, varying all the way from 6 to 10 per cent. At the rate of 4 per cent, an average floor joist 12 in. deep would shrink upon drying .48 or practically ½-in. while an 18-in. joist would shrink .72 or approximately ¾-in.

Just compare this heretofore ignored shrinkage with the expansion of a steam riser 100 ft. long supported in the middle. The steam pipe, as previously pointed out, would expand slightly more than ½-in. up and down, or less than the shrinkage of one 18-in. joist! I have seen, and no doubt you all have, radiators held off the floor at the inlet end by the pipe connection. There being no appreciable expansion of pipe for the short length used, the fitters had provided no swing connections; then, when the inevitable shrinkage occurred, the radiators (one-pipe connection) were held up at the inlet end enough to trap the radiator and cause a rattling, snapping sound. Most connections to first floor radiators are made in this way

without allowing for contraction and expansion, which is seldom more than .05-in. but while contraction for that small distance is infinitesimal, shrinkage is a factor not to be ignored, for in the average building it can be assumed to be between ½ in. and 3 in. for each tier of floor-beams.

But it is not the steam radiators alone that are affected by the shrinkage of floor-beams. When the average building is completed, the floor-beams are not only green but they are saturated and swollen with rain-water and moistened from plastering. While in this condition, the floors are laid and closets are set in place. With the inevitable shrinkage which comes, the floors fall away from the fixtures, which are left without support, to be broken at the floor-flange, or else the weight of the fixture when in use forces down the entire roughing at the expense of the joints or bends. If iron bends are used, the plumber must be called in when the joists are through shrinking to lower the connection.

It is not necessary at this time to go further into the matter. All that I wish to do is point out to your association and emphasize the importance of settlements and shrinkage in buildings and the necessity for providing flexibility to take care of the movements. This flexibility can be provided as in the case of steam piping, where the movement is less, by means of swing-joints, or any other means that are sanitary. Once the trade realizes that floor-joists shrink in 12 in. more than steam pipes expand in 50 ft., that buildings settle into the soil more than steam pipes expand in 400 ft., and that rain-leaders and soil stacks settle from their own weight enough to tear apart fixture connections, the means of overcoming these various movements can very safely be left to their ingenuity.

C. M. KEMP PASSES AWAY.

C. M. Kemp, president and founder of the C. M. Kemp Mfg. Co., makers of pipe-threading devices at Baltimore, Md., died at his home in that city on Monday, July 24th, in his 59th year. Mr. Kemp was an ideal citizen. For years he took a keen and active interest in all things which he considered to be for the making of civic righteousness and the uplifting of the masses. When W. J. Bryan was making his first race for the presidency Mr. Kemp became imbued with the ideas of the great leader, and after an exhaustive study of the large issues then before the American people, decided to espouse the cause of Mr. Bryan, and putting his shoulder to the wheel, he entered the contest with all the vigor at his command. He then became the candidate for mayor of Baltimore on the silver Democratic ticket, but went down with Bryan in defeat. He was not daunted, however, with this and succeeding reverses met by his party, but remained an ardent admirer of Mr. Bryan until the last. Mr. Kemp was unique, in that he conducted his big manufactory on the principle of the Golden Rule; his attitude toward his employes being rather that of a friend than an employer; his unusual goodness and kindness is shown in the fact that many of them have been with him for periods ranging from 15 to 30 years. Mr. Kemp took up the study of Christian Science several years ago, finally adopting it as his religion. Into this he put all the zeal and energy that characterized his every move and the persuasive eloquence of which he was a master, relying upon his religion until the very end, and dying with the firm conviction that its principles were right. He was a deep thinker and a man of marked culture. He was kind-hearted and easy to approach; was a great lover of children. Among his characteristics was his rugged honesty, from which nothing could swerve him, and which he exemplified in his every dealing with his business associates and employes. His ear and heart were ever open to all worthy charities and his purse was always open to appeals for help.

A NEWARK (N. J.) CASTLE.

Editor "Domestic Engineering":—Relative to the "photographs of the large jobs" that we "are doing," we beg to state that by the aid of the "violet ray" (so useful in microscopic studies) we hope in the near future to forward to "Domestic Engineering" a 37 x 46 in. negative of the largest air castle that was ever plumbed.

The castle has 400 bath-rooms upon every floor, and as the number of stories totals 200, it will be readily seen that there are 80,000 in all.

The intakes, directly from the ocean, assure an immediate supply of cold water, while that taken from elsewhere will deliver red hot water upon the instant.

All the fixtures, tubs, boilers, lavatories, in fact supplies of every description and character, are to be furnished by the Aerial Foundry & Construction Co. (with Pittsburgh connections), who will also furnish the revolving needle-baths, by which one is shot at all angles at the rate of a mile a second—("Pat. applied for"). Of course there was great competition to get the job. Berla was a "little high" while Farrell was "too low"—they wouldn't give it to him, at all. But we got the job. There are a whole lot of the boys wondering how we are "coming out." This on the quiet—It's largely a matter of "credit," and we are not worried. It's up to the Aerial people—just as in the case of other jobs, everywhere, where the supply men are obliged to walk the floor—or flunk.

William Jacobus, Aerial Constructor.

Yes, as you say, "Newark is a most marvelous place" and then to cap the climax of it all, we have got the best master plumbers' association upon the face of the earth. All good looking men; "all wool and a yard wide," and every soul of them as modest as a hen that never laid an egg—Look at Sam Wilson, Louis Maier, Baillet, not forgetting Selden Walker, or yours truly,

Newark, N. J. William Jacobus.

ADDRESS WANTED.

If "Constant Reader," whose inquiry regarding method of cleaning out a service-box recently appeared in this department, will send his name and address to the editor, we shall be pleased to forward some literature which has been sent us for his information.

BUSINESS MANAGEMENT

NEW METHODS FOR OLD

"THE SQUIRE'S" ADVICE TO THE BUSINESS BEGINNERS.

Editor "Domestic Engineering":—Ye interrogating editor has most assuredly come across with a few real questions when he asks as to the amount of money required to start in the plumbing business, the manner of investment, the question of discounts, advertising policy, partnership joys and sorrows, and the handling of specialties common to a plumbing establishment. Be that it may, we will endeavor to answer them after our own experiences.

First. I would put the capital at $2,500, a sum which any competent mechanic should be able to accumulate in a very few years, particularly if two men go in together and each invests one-half. I figure that with this capital, properly handled, a firm should do a business amounting to about $20,000, making it necessary for them to turn over their capital about eight or nine times per year, with a possibility that they can do it oftener than this by a judicious acceptance of contracts and jobs.

Second. The initial investment would call for a horse and wagon at about $300; an office desk, chairs, stove, lights and stationery at about $150; tools of various kinds at about $200; work-benches and fitting-racks about $50; advertising appropriation for about the first three months $100; a small stock of brass goods, fittings, pipe, traps, etc. of sufficient number and variety to care for any ordinary repair-job or for the rough work in ordinary building, costing about $300; with an additional sum of $200 invested in staple show-room fixtures, sanitary specialties, gas goods, etc. The show-room fixtures should be such as are known as staple sellers, so that one or more of them may be taken from the show-room from time to time when needed in a hurry. This makes a total of about $1,300, leaving $1,200 for a working capital, which will soon be absorbed in book accounts and merchandise purchases.

Third. By all means discount your bills, even if you find it necessary to borrow money from the bank with which to do so. Buy carefully and buy in small amounts, and only buy such material as can be turned over in a hurry. Do not buy in large quantities at the start unless you can pay for the goods.

Fourth. By all means let the people know that you are in business, and there is no better way than by a careful use of newspaper space.

Fifth. Handle your own business in your own way and let your competitor do likewise and if asked regarding a competitor either speak a good word or hold your tongue.

Sixth. I firmly believe that the plumbing business is one which can best be handled by two men and at the same time I realize that is is a mighty hard proposition to get two men who can travel in double harness. Assuming that you can do so, arrange for one man to attend to all of the outside work, the supervising, estimating, running around, etc. and let the other fellow run the shop and office. To be successful, it is absolutely necessary that one of the bosses be in the office at all times to handle the various questions as they arise; to keep the men moving; to keep stock in shape; to care for the tools; to get the material to and from the jobs on time; to answer the 'phone; to estimate from plans brought into the office; to handle the correspondence, and to dicker with the various and numerous peddlers of plumbing supplies.

Seventh. By all means carry a stock of salable specialties. Run light on gas fixtures unless you intend to specialize in this line, as the fixture business will tie up a whole lot of money and is turned over very slowly; beware of too large a stock of bath-room trimmings, for you will have to compete with the racket and department stores in this line; avoid cleaning preparations, as they are as numerous as the sands of the seashore and may be purchased everywhere; but if you find that there is a demand for gas mantles and burners, carry a small assortment of them and they will be found to be a paying proposition.

"The Squire."

PITTSBURGH PENCILINGS.

For the amount of energy that is being put forth to secure business, the plumbers of the western Pennsylvania and eastern Ohio districts find that jobs are not as numerous as the effort otherwise would demand. Now that the vacation season is at its height, there is less new construction work going on than at any other month during the year. It is admitted, however, that business conditions as a whole are not what they should be, and while there is a fair amount of work being let, the jobs are of the smaller character. Of course, this refers to local conditions solely.

It appears that more business is being done by the heating and ventilating contractors in the Pittsburgh district than usual, and as a result some very favorable contracts have been let during the last few days, among the number being the following:

Bartley, Kennedy & Co. will do a $4,700 steam heating and ventilating job for a new school in Beaver Falls, Pa.

The steam-heating contract for an addition being built to the high school at Butler, Pa. has been awarded to the American Warming & Ventilating Co.

The Toronto, O., Board of Education has given the Pittsburgh Heating Co. the contract for the complete heating and ventilating work on a new school-house being built there.

Burns & Fleming have been awarded the heating and ventilating in the $10,000 residence going up for Dr. C. L. Curll.

McFadden & Craig have the plumbing contract in the $25,000 home being built by F. C. Irish.

Carson & White get the plumbing in the $150,000 residence going up for W. P. Snyder, which is one of the best contracts of the character let in the Northside district this season. P. F. Maginn & Co. will do the heating and ventilating work.

It was an $8,000 contract which the McGinniss-Smith Co. secured when it landed the contract for the heating and ventilating systems to be installed in the new Mt. Washington sub-district school. The same company has also been awarded the heating-plant work in the new Christian church at New Castle, Pa., which is worth $3,000, and another $5,000 contract landed by the same company was for the heating system in the new Crutchfield-Woolfolk building at Penn and Shady avenues in this city.

The Reliance Heating Co. has been awarded the contract for the hot-water heating in the $25,000 residence and garage being built by F. F. Rohrer in Mead street near Dallas avenue. It also has the contract for the hot-water heating system in the new $15,000 residence being erected here by H. W. Ludebuhl.

Domestic Engineering "First-Aid-to-the-Injured"

Postal Card Cartoon—No. III.

"What Did I Forget?"

Hundreds of our cartoon postal-card No II. were called for last week and are now being distributed all over the country.

"WHAT DID I FORGET?"

This week's postal-card will prove most effective as a winner of men from slipshod and haphazard business-thinking. It is this kind of forgetfulness that undermines confidence and commerce. Of course, you know it, but there are many who do not. Send out some of these cards to those you desire to help. Let us all stop forgetting and make money. You can obtain as many cards as you desire free. Send for a dozen or two and set them going. We will send 25 or 50 if you can use them.

Sewer Gas and Disease*

A Popular Belief Definitely Shown to Be Baseless—Sewer Air Not So Filled With Germs of Disease as the Air of the Street

By Hollis Godfrey, Author of "The Health of the City."

The article which follows is frankly an attempt to tell the city householder what is actually known about sewer-gas and to explain some of the studies made in recent years on house-drainage and plumbing, with regard to their bearing on the public health. It includes the story of a notable public action on the part of a craft. It tells of an investigation whch threatened to overturn the sanitary beliefs produced by years of experimental labor. It relates the way in which the results of that research were translated. Most of all, it endeavors to show that the old bogey of specific disease rising from the sewer has disappeared and that the only injury which can come to us from the sewer is through general predisposition to disease. Unquestionably, no community should be obliged to breathe sewer-air any more than it should be obliged to drink sewage-polluted water, even when that water has been cleansed of its dangerous constituents. Every community should have regulations to prevent such occurrences. But those regulations should be based on the actual conditions which exist in sewers and house-drains. Needless emphasis on guards to defend the household from non-existent dangers, lessens the energy needed to combat the many real evils of our civic life. It is a matter of immediate importance to every city dweller to know the relation between sewer-air, house-drains and the health of the inmates of each home.

The Universal Horror of Drains.

Few of the sanitary theories of the city worker are more firmly fixed than his belief in the dread effect of sewer-gas. He may have no hesitation in drinking water whose source offers every possibility of pollution from typhoid germs and may fear no danger in the milk which feeds his child. He is, however, generally strong on drains. What is more, there are probably few sanitary matters on which there seems to be more personal evidence. So many people can refer you to some house where there have been cases of diphtheria, pneumonia, dysentery or typhoid, and in which broken drains or leaky drain-pipes have been discovered. Trace those cases down, compare them with the total amount of reported sickness from these specific diseases and you begin to become sceptical. No epidemic of disease has been reported where reliable statistical evidence exists of causation by sewer gas. There are a goodly number of well authenticated reports of sporadic illness where sewer difficulties have existed. The difficulty is that there are leaky drains on every side without a trace of disease. Epidemiology, on the other hand, is filled with reports of disease whose causation has been definitely traced to water or to milk. Is it not possible that the danger from this special source has been exaggerated and that in attributing much trouble to this cause we have been led to neglect the greater dangers of poor water, poor food, overcrowding and bad air? There are plenty of real evils in the city. We have no time to fight with chimeras.

When people first began to believe that the deposition of sewage in back yards and gutters might be a cause of disease, it is hard to tell. We can, at least, fix a date when one man advanced that belief to the status of a theory, 1858. In that year Charles Murchison brought forward the pythogenic theory of disease. The advocates of this theory held that whenever organic matter, such as that found in sewage, decomposed, emanations which caused disease were produced. Murchison applied this theory especially to typhoid fever, and his followers did a great work in cleaning up towns and cities, and in caring for sewage disposal. They did their work in the belief that disease proceeded directly from the emanations from sewage. Their work resulted largely in a separation of sewage from the water supply, an invaluable accomplishment. Performed though it was under the impetus of a false theory of the causation of disease, the true theory which followed demanded similar action, carried yet farther.

The germ theory of disease, which followed, burst like a bombshell in the camp of the believers in the pythogenic theory. Tyndall, Lister, Pasteur, Koch and others of that great group of investigators proved beyond a shadow of a doubt that infectious disease was caused by germs, tiny, living organisms, and settled one point forever. Typhoid, pneumonia, diphtheria and the like could not be produced by gaseous emanations from filth or sewage. They could only be produced by the entrance into the body of the specific micro-organisms which caused each specific disease. A definite micro-organism, the Bacillus Typhosus, must enter the body if typhoid was to be produced there. Another and wholly distinct organism, the Bacillus Diphtheriæ, must enter the body before diphtheria can occur.

The proof of the germ theory of disease had no great effect upon many believers in the evils of sewage-gas. It merely shifted their point of attack. "If germs were the cause of disease," they said, "then the germs from sewer-air rose into the house and attacked its inmates." Sewer-gas, moreover, according to these believers, laid its victims low by producing a lack of resistance to disease.

After some thirty years of research the possibility of direct infection by specific disease germs mounting from the sewer and producing specific diseases, is practically settled. The second possibility—which involves predisposition to disease on the part of those who are exposed to sewer-gas—is not yet decided. It should be carefully noted, however, that such predisposition is only likely to be general, that it can probably only lessen resistance in such a way as to make its victims more liable to any or every disease to which they are exposed. It is conceivable but improbable that sewer-gas might exert a specific predisposing effect for typhoid. Lowering of resistance is a different matter from the imparting of disease.

What is Sewer-Gas?

According to the Century Dictionary, sewer-gas is "the contaminated air of sewers." Assume that to be the common definition and expand it. The air of a sewer in its chemical composition can be little different from the air of a street. The chemical elements and compounds which compose the great body of the atmosphere are the same in either case. If sewer-air is contaminated, that contamination can only arise from one of two causes, either from the addition of poisonous gases which are produced by the decomposition of the organic wastes which sewage contains, or from the rise into it of dangerous micro-

*From "Boston Evening Transcript."

organisms present in the liquid which flows through the sewer-pipes.

The amount of poisonous gases likely to be evolved from sewage is generally small. Sewage is made up from the washings from sinks, from water-closets, from a hundred processes involving the use of water, from rain and melted snow. It runs to its ultimate destination in a greatly diluted flood which seldom contains more than one part in 1,000 of organic matter. That amount could furnish but little gas under any circumstances. Add the fact that the evolution of gases is dependent upon decomposition and that sewage is rapidly hurried on to its place of disposal. It is evident that it can seldom advance to the point where there is any material amount of decomposition.

In this connection it is especially worthy of note that, according to Richards and Woodman, ill-smelling gases are given off only when sewage is about 18 hours old. The rapid removal of sewage from the city makes the danger of such gases rising from the sewer, in which the liquids are carried to their point of final disposal, slight indeed. In a well sewered city, therefore, there is no great probability of the evolution of large volumes of poisonous gases from sewage. Sewage in the septic-tank, when stored, produces a considerable amount of gas but only under what are known as anerobic conditions, conditions where the oxygen of the air is not admitted. The house-drain, the broken pipe from which sewage seeps into the soil, and the ill-constructed waste-pipe, or perhaps more especially the cesspool, where stagnant liquid stands, may also provide some gas. Those conditions will be mentioned later.

Direct Comparison of Street Air and Sewer Air Demanded.

Rightly enough the possibility of direct germ infection from the sewer has attracted the most attention. We may learn from any analysis that there are great quantities of the germs which cause disease in the fresh liquid sewage of any city. It is a matter of very real importance, therefore, for us to know whether or not these micro-organisms are likely to fly upward, escape into the air above and infect the household. Speculation on this point is wholly valueless. We have one plain way before us—a quantitative and qualitative examination of sewer-air to determine whether or not it is more dangerous than the everyday air that we breathe throughout the 24 hours of the day. Many people breathe the most dust-laden atmosphere without a thought of harm, who believe sewer-gas a deadly misasma. Here is a chance for a comparative study. Let an investigator take equal quantities of street-air and sewer-air and examine each sample, under the rigorous laws of the laboratory, to determine how many bacteria are present and what kind they are. If rightly carried on that will tell the story and furnish the proof.

It is not enough to investigate natural phenomena under one set of conditions or with limited amounts. Only by repeated investigations made under the closest approximation to natural conditions possible can the truth be found in the laboratory. Take the especial case under consideration as an example. The air of the sewer may be inert, stagnant. It may vary in velocity from a gentle breeze to a rushing wind. The swifter the wind, the more the possibility of its raising germs from the surface of the liquid below. Sewage normally flows in a quiet, steady stream. But water falling into it goes down in a cascading spray filled with bubbles of air. Both the quiet liquid and the bursting bubble should be investigated. The research to determine whether or not dangerous germ enemies of man exist in sewer-air should be carried on under conditions like those which actually occur.

There are some peculiarities of certain members of the bacterial family which should be mentioned here. Two of the bacteria most closely connected with this problem are the Bacillus Coli and the Bacillus Typhosus. Constantly found in the intestines of man and of many of the higher animals, the collon bacillus is especially characteristic of sewage, where it is found in enormous quantities, while the typhoid bacillus is the micro-organism which, beyond all others, causes water-borne disease in temperate climes. Both these bacteria are closely related. Their prevailing form is that of a plump, straight rod with rounded ends, which is approximately one-twenty-five-thousandth of an inch in length. Similar as they are they can be clearly distinguished by bacteriological methods. Both these germs, tiny as they are, have perceptible weight and swiftly settle out of the air. Following the general rule of the bacteria, they flourish in dirt, darkness and moisture, all of which conditions are found in sewage. There is no condition known in which they tend to leave any liquid media for the air.

What Three Nations Have Found.

The three countries most interested in sanitary reform, Germany, England and America, each offered their share of investigators to the end that more light might be shed upon this question of direct infection from the germs of the sewers. The experimental results reached in every country were similar and have convinced the great body of experts in Germany and the United States. They have not been sufficient to overcome the conservatism of some British sanitarians, who have been more affected by the reports of local authorities, who have attributed typhoid and other epidemics to poor drains, than they have been by the carefully controlled work of the laboratory. France and Italy, in the work of Miquel and D'Alessi, have furnished two of the most noteworthy researches of the series.

Britain's contributions to the subject may be said to commence with the work of Sir Edward Frankland, who, like Pumpelly in America, made a careful investigation of the bacterial life existent in air above quiet liquid sewage and in air above sewage from which bubbles of gas, generated by the decomposing organic matter, were rising. Both Frankland and Pumpelly decided that, under ordinary circumstances, germs could only be thrown off by the bursting of bubbles, that they did not rise from the quiet liquid. Carnally and Haldane, in a long and careful study of English and Scottish cities, found in practically every street a greater bacterial population per given quantity of air than was found in the sewers beneath the street. The kinds of bacteria occurring in street and sewer were the same and wherever, for any reason, the number of the micro-organisms increased in the street, they increased proportionally in the sewer. Laws and Andrews in a similar investigation carried the matter yet farther. They determined that molds and micrococci, both especially characteristic forms of street-air, were most abundant in sewer-air. Even more important in some ways was the discovery of these investigators that Bacillus Coli, the most typical bacterial form of sewage, was not found in any sample investigated.

The German results include numerous investigations, from those of Nageli, who concluded in 1877 that infectious materials in general pass into the air only after drying, and then in the form of "dust," through the work

of Uffelmann, Flugge, Petri and Ficker. Discussing the whole matter in 1895, Kirchner and Lindley, in a paper read before the German Society of Public Health, came to the following conclusions:

"1. The assumption of the spread of epidemic diseases, such as typhoid, cholera and diphtheria, by sewer-gas does not harmonize with our present knowledge of the nature of the causative agents of these diseases.

"2. On the other hand, the gaseous products of decomposition arising in sewers and house-drains may be harmful, indirectly if not directly, to those exposed to them for a considerable time; they may produce nausea and may lower the general tone of the body, including its resistance against disease."

Sewer Purer Than Street.

One of the most interesting investigations of the whole series is the comparative study made every year for 16 years by Miquel, who annually for that whole period counted comparative numbers of the bacteria under similar conditions in Paris streets, in the French country side at Montsouris and in the Paris sewers. Some amazing results as regards numbers were secured. If we average four years of the series, we find approximately one bacterium in country-air to 14 in the sewers and to 30 in the street, the exact results being 1 to 13.817 to 29.976. According to Miquel there are less than half as many of micro-organisms in the sewer as in the street.

In America, besides Pumpelly already mentioned, Abbott, Hazen and Ruttan, Whipple and Harrington came to similar conclusions—that danger of infection from germs rising from the sewer was practically negligible and that bacteria arose only when they reached the sewer in spray or were thrown from it on bursting bubbles of gas.

Plumbers of America Start an Independent Investigation.

In 1905 affairs rested on the basis of the experiments just described. German and American sanitary authorities in general did not believe that direct infection from the germs of the sewer was at all probable. One section of the body of British sanitarians thought differently. A large proportion if not a majority of the general public was convinced that typhoid, diphtheria and other similar diseases rose directly from the sewer when there was any drain-trouble in the house. Then in 1905 occurred a notable event—the determination of a craft officially to take up a scientific investigation, through the employment of trained investigators, who were to conduct a research in one portion of their field of labor. The National Association of Master Plumbers of the United States, acting upon the suggestions offered by its Sanitary Committee of 1905, authorized that committee to make plans for an investigation to determine, in the words of the report, "how much sewer-gas was to blame for the carriage of disease, and if so, to what extent."

It is a remarkable tribute to the gradually spreading belief in the touchstone of the laboratory that this committee, finding no place in the world where investigation of the questions, which they desired to have settled, was being carried on, started upon a research of their own. Most corporations have already learned that a chemist may save them thousands of dollars. Many business interests have come to recognize that research which involves utilization of by-products or produces methods for shortening processes means greater profits. It is certainly rare, if not unique, to find a national association of a craft commencing such an undertaking for the public health, spending money for an enterprise which does not immediately affect the pocketbooks of the members. This action of the Master Plumbers' Association merits no slight praise.

There was, fortunately, one place where problems of sewage disposal had been especially considered for some years. Since 1903 the Massachusetts Institute of Technology has maintained a sanitary research laboratory and sewage experiment station, designed, in the words of the catalog, for "the investigation of problems relating particularly to the purification of the sewage of large cities, for the demonstration of sanitary methods and appliances, and ultimately for the advancement of popular education in public health subjects." The Sanitary Committee of the Master Plumbers, consisting of David Craig, chairman, and Messrs. Balme, Decker, Morgan and Highlands, arranged with the Institute of Technology to erect needed experimental apparatus in the laboratory of the sewer station and intrusted the work to Professor E. A. Winslow of the faculty.

The investigations which preceded the one now under consideration had chiefly been concerned with sewer-air proper; that is, with the air of house-drains. It had been reasonably established that sewer-air was freer from germ life than the air of the street. It had not been proven that, assuming the ordinary conditions of the discharge of water from a water-closet or a sink in a house, germs from a broken drain, a cesspool, an unsealed trap or a badly placed vent might not make their way into the air of rooms. It was just this question of the possibility of danger from house-plumbing that this research undertook to solve.

(To be continued.)

PENNSYLVANIA JOTTINGS.

One of the best heating, ventilating and plumbing jobs in sight in the Pittsburgh district now is that found in the construction of 12 one-story business-rooms at Fifth avenue and Grant street, an improvement which is being made by H. C. Frick, the well-known millionaire and former partner of Andrew Carnegie. Each store-room will measure 20 x 100 ft. The improvement will go up on the old Cathedral site, which is opposite the Frick and Carnegie buildings.

Some of the smaller plumbing and heating contracts awarded contractors in the Pittsburgh district recently are as follows:

Erie, Pa.—Erie Heating & Plumbing Co., heating and plumbing in business block addition being erected by J. C. Scarlett Co

New Castle, Pa.—Edward Stevenson, plumbing work in $20,000 new First Methodist Episcopal church. Burns & Fleming, Pittsburgh, were awarded the heating contract.

Cambridge Springs, Pa.—L. L. Lord & Co., of Meadville, Pa., plumbing in $15,000 hotel being built by Mrs. Joseph Grief.

Erie, Pa.—Meyer & Pfadt, plumbing and heating in $4,500 residence for C. P. Einhellig.

Waynesburg, Pa.—William Zimmerman & Co. will do plumbing in the $7,000 home for Dr. R. W. Norris, while the heating will be done by William Fisher & Co.

Waynesburg, Pa.—Plumbing in the new $15,000 First National Bank will be done by A. C. Specht.

Johnstown, Pa.—The Johnstown Supply House was awarded heating, ventilating and plumbing contracts in the remodeling of the Cambria Theater, which is being done at a cost of about $60,000.

Bradford, Pa.—Plumbing in the $3,000 club house being built by the Bradford Gun Club will be done by A. D. Burns.

Arnold, Pa.—The Elwood Plumbing Co., of New Kensington, Pa., will do the plumbing work in the $2,500 residence of Henry Stamp, while W. J. Phlough, of New Kensington, will do the heating and ventilating work.

Kittanning, Pa.—Hoey & Galliger have been given the heating and William Bowser will do the plumbing in the new residence of Mr. Latshaw.

Mt. Lebanon, Pa.—Knoxville Plumbing Co., Pittsburgh, plumbing in $19,000 business building being erected by K. E. Algeo.

Rock Island, Ill.—The Rock Island Register Co. has been incorporated with a capital of $30,000, to manufacture and deal in general heating and ventilating supplies. The incorporators are: J. J. Burgess, S. P. Burgess and Jens Nielson.

QUESTIONS AND ANSWERS

PREVENTION OF LEAKY NIPPLE-JOINTS.

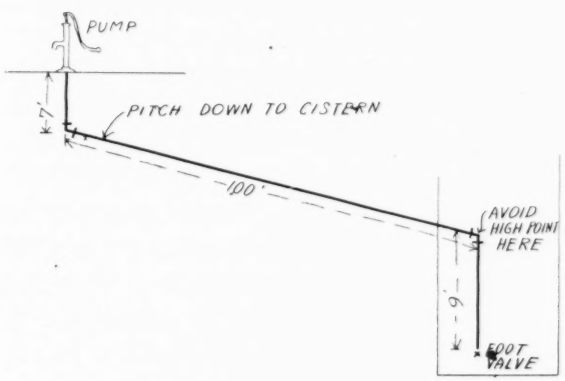
Editor "Domestic Engineering":—One of our customers is having considerable trouble with a steam boiler in the leaking of nipple-joints between boiler and mud-drum. At present it is connected by long thread with locknut on one end of nipple; both threads are right hand.

We would like to know if it would be advisable to connect with two nipples and gasket-unions? W. J. W.

We should think that the nipple could be screwed in sufficiently tight at one end to hold without leaking and the locknut backed off enough from other end to allow a packing of asbestos wicking to be used. Twist the wicking moderately tight, then apply some good lard-oil. Do not attempt to make the joint with one packing. Put on a good one first, screwing the locknut well down. Then back off the locknut and apply another packing on top of the first one. One or two trials should render one competent to make a joint this way so that it will never leak.

THAT PITCHER PUMP OUTFIT AGAIN.

Editor "Domestic Engineering":—In answer to Geo. Sawyer, whose inquiry concerning the fitting up of a pitcher-pump outfit was printed in the issue for July 1st, I would recommend as follows: Under the conditions outlined in the query, the use of 1-in. pipe would doubtless prove more or less unsatisfactory because of the small amount of water which would be delivered at each stroke of the piston, and the amount of labor required to operate the pump, as compared to the service which would likely be secured from the use of 1¼-in. pipe for the suction, considering the 100 ft. of horizontal suction and the vertical suction of 16 ft. (raise 9 ft. from the cistern and 7 ft. to house). The practical value of this criticism is clearly apparent.



The use of 1¼-in. pipe instead of 1-in. would undoubtedly reduce the friction, lighten the labor, pump a greater quantity of water in a given time and consequently, in the long run, prove to be by far the most satisfactory job. In any case the suction-pipe should be arranged so that it will have a gradual ascent from the point where it turns to drop in the cistern to the cylinder, being particularly careful to avoid a high point at the elbow where it drops into the cistern, so as to avoid an air-trap at this point. It would be of good advantage to place a check-valve or foot-valve at the bottom of the suction-pipe so as to keep same continually primed, the outfit as described being arranged about as shown in accompanying sketch.

RADIATION, SINGLE-COLUMN.

Editor "Domestic Engineering":—Tell me why single-column radiation is said to be more effective than two, three or four-column radiation of perhaps the same make.

"Radiation."

Where it is possible to make use of single-column radiation, it is said to be more effective from the fact that it presents to the air a larger amount of surface that is not affected by the other loops. The middle loops of a 3-column radiator are more or less shut in from the air and so cannot be considered as effective as those which have a clear exposure to the air.

ABOUT COST OF DIGGING—HE GUESSED RIGHT.

Editor "Domestic Engineering":—In your issue for July 22nd, I notice that you tell an inquirer that the cost of digging will vary from $3.50 to $5 per cu. yd. There must have been some mistake and the printer made it $3.50 when you wrote 35 cents and made $5 when you wrote 50 cents; a lesson to editors to be more careful with their handwriting.

From many years' experience in laying sewers and water-mains, the writer has observed that men will excavate and throw on the bank 10 cu. yds. of sand or easy earth and from that down to 6 cu. yds. of very hard picking earth in a day of eight hours. In back-filling with shovels, any good workman should average from 12 to 16 cu. yds. in eight hours. For shallow work, that is trenches not more than five feet deep, the above output should be increased about 50 per cent for excavation but the figures for backfilling maintained. If a laborer is paid $1.50 for 8 hours' work and can put out 8 cu. yds. of earth, the cost will be a trifle under 19 cents for digging. The cost of backfilling will be about 12 cents, thus making the total cost per yard only 31 cents, instead of $3.50. It is seldom that stone which must be drilled and blasted, will cost more than $2.00 per cu. yd.

Chicago. Ernest McCullough.

SQUARE FEET OF RADIATION.

Editor "Domestic Engineering":—When we say "square feet of radiation," just what do we mean?

Makatoqua. J. Horton.

We are speaking with regard to the amount of surface on the outside of the radiator. If we should say, "that radiator has 40 ft. of radiation," it would mean that there were 40 ft. (supposedly) on the surface of the radiator that were exposed to the air, regardless of the height of the radiator.

THE METAL MARKET

NO CHANGE IN PIG-IRON.

Consumers of pig-iron display little interest in the market, but at the same time the blast furnace interests are not disposed to press any iron on the market. Consumption seems to be about equal to production and therefore no anxiety is felt by consumers, and there is no opportunity for makers to demand higher quotations. The buying of a fortnight ago satisfied consumers' needs for the time being and there would be little gained by attempting to force sales. Some Buffalo makers have succeeded in advancing quotations about 25 cents and, on the other hand, some sales of Virginia iron have been made at a concession of 25 cents a ton. Prices are unchanged and quoted as follows:

No. 2 Southern foundry, Birmingham	$10.00
No. 1 Northern foundry, New York	$15.50 to 15.75
No. 2X Northern foundry, New York	15.00 to 15.25
No. 2 plain, Northern foundry, New York	14.50 to 15.00
No. 2 Northern foundry, Chicago	14.50 to 15.00

OLD IRON.

A moderate buying is noted and dealers are in hopes that this may result in more activity later in the year. As it is, prices are dull and almost stationary. The brokerage business is slack because of the difficulty in obtaining supplies. Quotations are as follows:

No. 1 yard wrought, long	$11.50 to $12.00
No. 1 yard wrought, short	11.00 to 11.50
Heavy-melting steel scrap	10.75 to 11.00
Machinery cast	11.00 to 11.50
Wrought pipes and tubes	9.50 to 10.00
Malleable castings	10.00 to 10.50
Wrought turnings	6.50 to 7.00
Cast borings	5.75 to 6.25
Stove plate	8.50 to 9.00
Light iron	4.25 to 4.75

HEAVY SHIPMENTS OF TIN.

During the month of July about 5,000 tons of tin were imported into this country, an amount far in excess of the requirements of the month and the surplus did much toward giving a better working supply in this country. Prices in America are now down to London parity for the first time in several months. A sale of Banca tin in Holland this week, amounting to 2,500 tons, went at a price equivalent to 41.25 cents delivered in New York. This encouraged consumers, for it is felt that lower prices will be named hereafter. A feature of the business has been the buying by consumers for September delivery. The price in 5-ton lots ranges from 41.75 to 42.25 cents.

LEAD.

The market is much stronger and considerable business is being transacted among dealers. The St. Louis market is especially firm, dealers there demanding 4.45 cents for lead. In New York the American Smelting & Refining Co. is willing to sell lead for shipment in 30 days at 4.50 cents, while the outside sellers are asking 4.60 cents for spot lead.

COPPER.

The demand is moderate, but stocks are closely held and in spite of the small inquiry the price of electrolytic moved up 5 points during the week, it now being quoted at 12.60 cents compared with 12.55 cents a week ago. Lake is unchanged and in fairly large supply at 12.75 cents. The exports have kept up well and exceeded 31,000 tons for July.

SPELTER.

A moderate advance brings the price to the high level reached in June, sales being made at 5.80 cents. In St. Louis the market is firm at 5.60 cents.

OHIO ITEMS.

Canton, O.—The Widder Plumbing Co. has announced an increase in its capital stock from $10,000 to $15,000. Recently the company enlarged its place of business, and it is the policy of the company to carry on a greater furnace business.

Cleveland, O.—The Carey, Scott & Weiss Co., which was recently formed and is the youngest plumbing concern in this city, secured a fine contract when it was awarded the plumbing and heating work in an eight-suite apartment house which is being built there by L. C. Quayle. It's the old story of "young blood will hustle." The new firm is located at 2053 Prospect Ave.

Charleston, W. Va.—J. N. Zinn & Co. have completed the organization of the corporation, and a general plumbing business will be done. The company has a capital stock of $10,000. Jacob N. Zinn is president of the new concern.

Columbus, O.—All of the bids for the construction of the comfort station at Goodale Park, have been thrown out and new bids will be advertised for in the near future.

East Liverpool, O.—The city authorities have employed the engineering firm of Chester & Fleming, Pittsburgh, to prepare plans and specifications for the installation of a well supply. It is proposed to drill about 20 wells.

Tiffin, O.—The city government has decided to employ an expert to report on the feasibility of extending the water-works system.

Columbus, O.—Director of Public Safety H. S. Holton will receive bids August 15th for 250 tons of cast-iron pipe for the water-works department of the municipal government. The proposals are to be for the pipe f. o. b. cars and also to be delivered along the line where needed.

Columbus, O.—The Columbus building department has announced that hereafter all persons contemplating the erection of a structure of any kind in the city limits must first secure the permit from the department. In the past the department has been lenient to a certain extent and no prosecutions have been made up to date. But hereafter the letter of the ordinance will be strictly enforced and prosepective builders will have to secure the necessary permits. A fine of from $5 to $500 and imprisonment up to six months is provided in the ordinance for violations.

PERSONAL MENTION.

T. K. McKnight has been made assistant manager of Crane Co.'s Detroit branch, which was opened July 1st.

John Duncan, sales-manager of the Wheeling Steel and Iron Works, was registered at the Strafford Hotel, Chicago, this week.

James Gillchrist, manager of the Indiana Supply Co., gave a talk this week on credits before the Chicago Jobbers' Association.

South Bend, Ind.—Chas. M. Oberlin & Co., is the name of a new firm recently incorporated with a capital stock of $10,000 by Chas. M. Oberlin, I. J. Miller, and H. F. Ritter. They purpose conducting a plumbing and heating business.

PACIFIC COAST LETTER

The most important event of the past week has been selection of a site by the exposition directors for the Panama Pacific International Exposition, and with this problem now disposed of it is anticipated that work will be commenced at an early date on the actual construction of buildings. The selection of a site was made after six months' careful deliberation, and the decision arrived at is generally pleasing to all concerned. Instead of this great exposition being located on the outskirts of the city like some side-show, it is to be an integral part of the city itself, with the points of chief interest easily reached. The concessions, aquarium, marine displays and heavy machinery exhibits will be located at Harbor View on a site of about 300 acres. The scenic attractions will be in Lincoln Park, the permanent buildings in Golden Gate park and the state, national and county buildings in a connecting strip of land. Altogether, more than 1,600 acres will be used for exposition purposes. A railroad will be constructed connecting Harbor View with the parks, as well as a scenic boulevard, and much of the improvement work done will be of a permanent nature. Telegraph Hill will be improved and beautified and an immense auditorium and grand opera house will be erected near the juncture of Market street and Van Ness avenue, not far from the headquarters of the master plumbers' association. Architects and engineers are now being selected and detailed plans for the great undertaking will be under way at once. Within a short time now work will be commenced on the project and business conditions are expected soon to show a great improvement. Much building work has been held up pending a decision in regard to the fair site but now that this is settled it is anticipated that there will be much activity in this line. The decision to have the exposition cover so much ground will mean that there will be an increased amount of building in many sections of the city, notably in the vicinity of the parks and in the Harbor View section. It will also mean the immediate rebuilding of the section of the city between Market street and Van Ness avenue, as this district will be fairly close to the main entrance of the downtown section of the exposition and will be particularly attractive as an apartment-house and hotel section.

The settlement of the celebrated Spokane rate case in favor of Spokane and other inland cities of the Coast territory, is now attracting the attention of jobbers in plumbing supplies; but just what the effect of the new rates will be upon business is a matter of opinion. All agree that the immediate effect will be the establishment of small jobbing centers in these inland places, but whether this will materially affect business is a question. Inland towns are now granted lower freight rates from the East but it is believed by many that the opening of the Panama Canal will so materially reduce transportation rates by water from the East that San Francisco and other coast ports will still be able to control their present territory and possibly extend it. In the meantime many jobbing houses will open for business in localities where there are none now and it is extremely likely that many San Francisco firms will open branch establishments at inland points to protect their trade.

Investigations have been under way at the Ferry Building to ascertain the efficiency of the fire-fighting system there and as a result a number of improvements will be made at once. A large amount of new piping will be put in, new hydrants installed and the old system thoroughly overhauled. The engineering department has been instructed to proceed with the work and considerable material will have to be purchased at once. Additions are to be made to the Ferry Building at an early date and much new plumbing will be installed.

A complete ventilating system is to be installed shortly by the state at the San Quentin penitentiary and a number of San Francisco firms have submitted bids for installing the work. These bids have been opened and are very close, the lowest having been submitted by Mangrum & Otter. The contract has not yet been let but it will probably be secured by this firm.

Work is commencing on the new building to be erected in this city by the Mark-Lally Co. and this will be rushed, as it is desired to occupy the structure at the earliest possible date.

E. Grundy has been awarded the contract for the installation of the plumbing, sewering and gas-fitting in a building being erected by Alice Russeau on Jackson street, near Montgomery, the contract being valued at $1,045.

Martinez, Cal.—The plumbing business formerly conducted by A. H. Mitchell, is now owned by M. S. Lewis.

Oakland, Cal.—Work has been commenced on the erection of the new city hall, and some of the rough plumbing will be installed at an early date by the San Francisco contractor.

Fresno, Cal.—Recently the journeymen plumbers went on a strike and for six days, building operations were tied up. The men asked for a wage advance of 50 cents a day, making the rate $5.50, and a week of five and a half days instead of six. The master plumbers have conceded to the latter request and have agreed to grant the increase wage after 80 days. This proved acceptable to the journeymen and they returned to work.

Oxnard, Cal.—The Dunn Manufacturing Co. will shortly commence the manufacture of pipe wrenches and other tools used in the oil-well business.

Spokane, Wash.—The Western Porcelain Manufacturing Co. has been incorporated by G. A. Griffith, O. J. Finch, J. A. McIntyre and others, the capital stock being placed at $300,000.

WISCONSIN WANDERINGS.

Milwaukee.—That a $1,500,000 filtration plant, as recommended by the sewerage commission, is unnecessary for Milwaukee is the opinion of former city engineer, Charles J. Poetsch. He believes, however, that the city should construct a flushing-tunnel for the Menomonee River. It would lie in Huron street, Clybourn street and St. Paul avenue and would cost $1,000,000, with branches connecting to the North and South Menomonee and Burnham canals. Mr. Poetsch also recommends the cleaning of the Muskegon avenue interceptor and the construction of one connecting the 25th street and Jones Island interceptors.

Two Rivers.—The heating plant in the E. Leicht Hotel and hall at Whitelaw has been installed by a new local concern, the C. D. Sibenhorn & Son Co. It will specialize in installing heating plants and electric equipment.

Portage.—The county board building committee let contracts for repairs and improvements at the county asylum in Wyocena recently. The Schulze Hardware Co. bid $990 on sewer work and received the contract. A proviso was attached to the contract that in case quicksand was encountered the county should make up for the loss to the company. The heating and ventilation plant will be installed by Bauer Bros., of Milwaukee, for about $4,600.

Racine.—The board of education has refused to take steps concerning defective plumbing in the Winslow school of this city. It is claimed that there was an infringement of the city's plumbing ordinance when certain plumbing work was done in that school and the board of education referred the matter to the board of public works.

Oshkosh.—The committee on heating and sanitation of the board of education of this city has recommended that the plans of William Walters for plumbing and heating the Orville Beach Manual Training school be accepted. A resolution was passed recommending that steps be taken to install a central heating-plant for the Manual Training and High schools.

Beloit.—The committee consisting of Aldermen J. J. Brittan, L. Woll, R. P. Robinson and City Engineer Caldwell which was sent to Chicago to inspect the various sewage-disposal plants there has made its report to the council. The underground septic tank has been recommended to the city by the special committee. It is necessary that a disposal plant be put in at the outlet of the sewer into Turtle Creek before school opens.

STANDARD SANITARY MFG. CO. DECLARES DIVIDEND.

The directors of the Standard Sanitary Mfg. Co., Pittsburgh, Pa., on July 25th declared the usual quarterly dividend of 1 per cent on the common and 1¾ per cent on the preferred stock, as well as the customary extra 1 per cent on the common stock.

TOLEDO MANUFACTURING & SUPPLY CO. IS FORMED.

Considerable interest is shown in the vicinity of Toledo, O., in the formation of the Toledo Manufacturing & Supply Co., which has a capital of $10,000 and will engage in the manufacture of plumbers' and steam-fitters' supplies. A deal will be closed soon for a site for a new plant. Frederick W. Widmaier, formerly associated with the general offices of the National Supply Co., of Toledo, will be general manager of the new company.

THE UNIVERSAL SANITARY MFG. CO.'S FIRE.

The fire which destroyed the plant of the Universal Sanitary Mfg. Co., New Castle, Pa., on the morning of July 15th was caused by spontaneous combustion. The fire was a very disastrous one, leaving the plant, with the exception of the boiler-room, in complete ruins. The loss was over $200,000, partly covered by insurance. An adjustment of the insurance has been made in full and plans are now under way for reorganization on a great deal larger scale than the original one. The company desires to express through "Domestic Engineering" its thanks to the many friends for telegrams and letters received expressing their sympathy for its loss.

THE ROBERTSHAW MFG. CO. SUCCEEDS THE SERVICE UTILITIES MFG. CO.

The House Service Utilities Mfg. Co., of Pittsburgh, has changed its name, and will continue in business under the name of the Robertshaw Manufacturing Co. The manufacture of the articles will be under direct supervision of Mr. F. W. Robertshaw, who was for years superintendent of the Acheson Mfg. Co., Rankin, Pa. The company will manufacture the Robertshaw Thermo Valve, and Excelsior Ball Cocks at their new location, 101-103 Water St., Pittsburgh, Pa.

The exclusive right for the sale of the Robertshaw "Quick" Thermo Valve was recently sold to the John Wood Mfg. Co. This right is for domestic water-heaters only, and the Robertshaw Mfg. Co. retains the right to sell the "Quick" thermo valve for use on house-heaters, and all other kinds of heaters other than domestic water-heaters.

TIPS FOR THE TRADE.

West Salem, Wis.—Miller & Drecktah want catalogs on plumbing supplies and furnaces.

Fairfield, Conn.—Fire destroyed the place of business of Daniel Rock. Plumbing was a feature. Catalogs for new supplies are wanted.

Pittsburgh, Pa.—The Elliott Hardware Co., which has changed its name to the Scholz Bros. Hardware Co., is asking for catalogs on furnaces and kindred supplies. A new business block is being erected by this company, which will be ready for occupancy early next spring.

Hutchinson, Kan.—M. C. Obee wants catalogs on pumps, pipe and fittings.

Sharon Springs, N. Y.—Plumbing is being done by George Klinkhart in connection with his hardware business, and he wants catalogs on plumbing supplies.

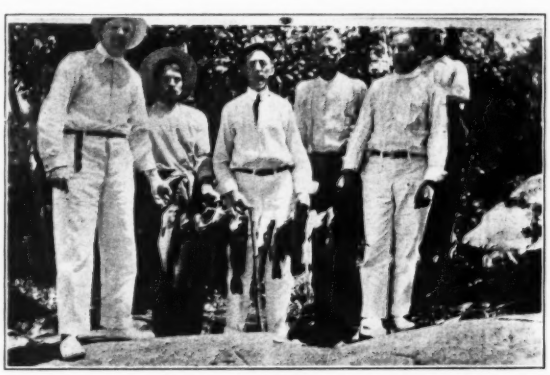
Baltimore, Md.—Arthur Vollerthum has recently made a number of improvements to his place of business and now seeks catalogs on plumbing supplies.

Galveston, Tex.—T. G. Olmstede, 1816 Avenue E, would like to receive literature concerning sanitary drinking-fountains.

Inquiries have been made through an American consulate in England by a large wholesale establishment for the following American goods: Flush valves, dart unions, chain wrenches, radiator valves, couplings, pressure regulators, pipe-cutting and threading machines, and die stocks. For direct information address Bureau of Manufacturers, Washington, D. C., and refer to File No. 7,038.

PISCATORIAL ENGINEERS.

Lots of people don't take a vacation. Lots more don't know how to enjoy one when they take it. This is not the case with the gentlemen shown in the illustration. We have not yet been able to determine whether one man caught all these fish, or whether all three of them shared, but they are up against the problem of dividing 14 fish among three men. We suppose they tossed up



These are the fish that did not get away.

for the odd ones. All this happened at Newboro, Ontario, where the capturers of bass spent a very enjoyable week. The famous scenery of the Rideau Canal soothed their senses between bites. The piscatorial engineers are shown in the front-row. T. J. Hessler, St. Louis, Mo., at the left; M. L. Foote, Columbus, O., in the center and R. J. Fitzgerald, Chicago, on the right. They are all live wires of the Iroquois Engineering Co., and have learned the lesson how to forget business and snuggle up to nature. If you haven't learned this lesson, go thou and do likewise. It is good medicine.

TRADE LITERATURE.

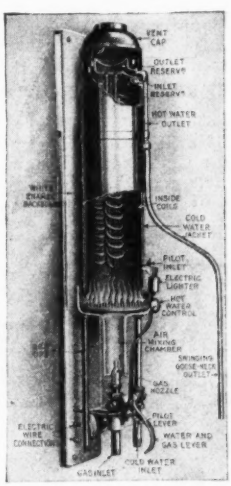
The J. C. Whitlam Mfg. Co., Cleveland, O., has just issued a descriptive leaflet of its "Tyte-Unyte" pipe-joint cement. This is a useful compound for screw-joint pipe-fittings, serviceable when putting together radiators, gas-fixtures, and boilers, and for all kinds of iron pipe-fittings used for the conducting of water, steam, gas, air and oil. It is claimed that "Tyte-Unyte" prevents leaks, corrosion and rust, not being affected by air, acids, moisture or alkali. It is adhesive, durable and elastic, lending itself readily to the expansion and contraction of the iron. Further particulars and quotations can be secured from the manufacturers, J. C. Whitlam & Co.

The American Blower Co., Detroit, Mich., in its Bulletin No. 315, describes and illustrates its "Ventura" disc ventilating fans. It is a curved-blade disc-fan in design and construction. An interesting feature of its action is that the air as it leaves the fan has a tendency to bend inward for a considerable distance before it begins to expand. In illustration of this tendency, one of the fans can be set 16 in. away from a hole in a box, and discharge more air on the other side of the opening than the fan itself handles, due to the siphonic action of the air passing through the opening and drawing with it air along the face of the box. In the center of the fan is a large disc, to which the ten blades are riveted. This disc prevents a back-flow of air when working against pressure The bulletin describes a number of its constructive features, and gives data as to the mechanical and comparative efficiencies of the "Ventura."

THE "MATCHLESS" WATER-HEATER.

The "Matchless" instantaneous water-heater is the product of the Barlow Co., Holyoke, Mass. The company also manufactures display fixtures and other specialties. The "Matchless" is diminutive in stature, only being 5½ in. in diameter. This, it is claimed, is advantageous, as it can be set in very small space. It is self-lighting, the pilot-light lighting the gas the moment it is turned on.

In operation, the manufacturers claim the heating of three gallons of water 50 degrees in a minute and a half



The "Matchless" Heater.

continuous running. This result is obtained largely through the small space in the water-jacket. The water passes between the outer and inner shells in such a small stream that the water is thoroughly heated before it enters the inside coils. The outside of the heater, however, remains cool, without the aid of asbestos or other heat-refracting materials.

The Barlow Co. claims a surprisingly small gas-consumption for the "Matchless," an ordinary basinful of hot water being obtained in 20 seconds. The heater is easily operated, one small lever controlling the lighting pilot, and one large lever controlling the gas and water. The gas and water lever is locked mechanically so that it cannot be turned on till after the pilot is lighted. It is thus practically "fool-proof." The heater is connected direct to the water-supply, so that showers and several other outlets can be connected and used to advantage. Further particulars and quotations can be obtained from the manufacturers. When writing for descriptive folders, mention "Domestic Engineering." We may add that the printed instruction-sheets are very comprehensive and cover every point of installation in detail.

THE "B AND C" FLOOR AND CEILING-PLATE.

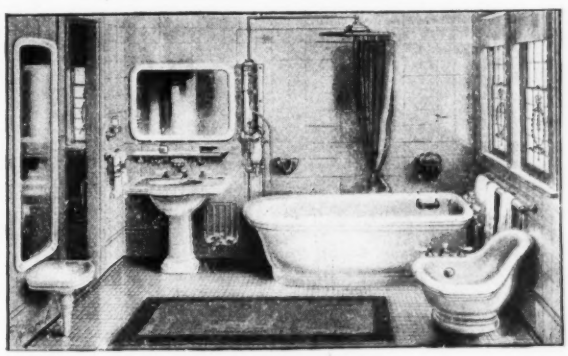
We herewith illustrate an ingenious hinged floor and ceiling-plate manufactured by the Beaton & Corbin Mfg. Co., Southington, Conn. It is fastened securely by a snap-lock and is manufactured of cold rolled steel. Its hinge

The "B and C" Floor and Ceiling-Plate.

allows of easy adjustment, and it is made in different sizes, nickel-plated, from ½ in. to 2 in. It will commend itself readily to the trade, and further information and quotations can be secured by writing to the company. When requesting information, kindly mention "Domestic Engineering."

INCORPORATIONS AND ADDITIONS.

The local trade has been advised of the formation of the Acme Specialty Co., of Toledo, O., which will make metal specialties and water heaters of an improved type.



A "Matchless" Heater Installation.

The company was formed with a capital stock of $25,000 by C. J. Schneider, of Toledo.

The Wise Furnace Co., of Akron, O., has made known the fact that because of its increased business the capacity of the plant will have to be enlarged. Plans are now being completed with this end in view.

The Stewart Tank Manufacturing Co., Cleveland, O., has been formed by Charles A. Morris and Owen N. Wilcox, with $25,000 capital stock.

Vacuum-Heating Apparatus Interesting to Steam-Fitters and Heating Engineers

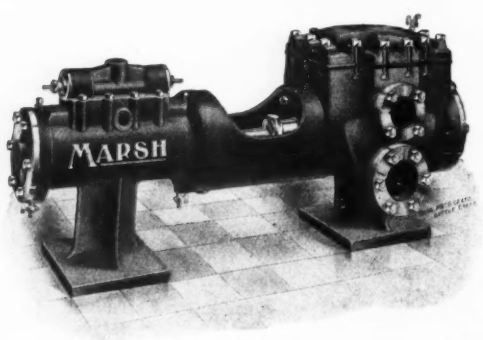
A VACUUM-PUMP WITH AN INTERESTING GOVERNING FEATURE.

One of the essential features necessary to a modern and efficient system of vacuum steam-circulation is the vacuum pump. There have been many experiments along this line and different devices have been gotten up with a view of creating and maintaining satisfactory vacuum on the return or tail pipes of vacuum-heating systems. One of the vacuum-pumps now being extensively used is the well-known Marsh design which is illustrated below, manufactured by the American Steam Pump Co., Battle Creek, Mich., Chicago office, 310 W. Randolph St.

In nearly all office buildings, manufacturing establishments, state, county and city institutions, steam is kept up continually, if not high pressure sufficient for power service, generally pressure is carried sufficient to operate a properly proportioned steam vacuum-pump, and in the use of this type economy is maintained, due to the fact that the steam that it takes to operate the pump is delivered through a proper oil-separator directly into the low-pressure heating line, hence the exhaust steam from vacuum-pump is properly utilized.

The Marsh pump has been manufactured about 21 years, during which time there have been many improvements made in the design which would add to its efficiency and wearing qualities. The manufacturers claim as the pump's chief advantage its positive governing element which is maintained entirely by the simple cylindrical balanced steam-valve shown in illustration herewith, which so controls the pump that it cannot possibly short stroke, race, pound or run away or injure itself no matter what happens to the vacuum or suction with full head of steam on. This is of special advantage in vacuum-heating work where often pump has varying conditions and runs from no load to full load.

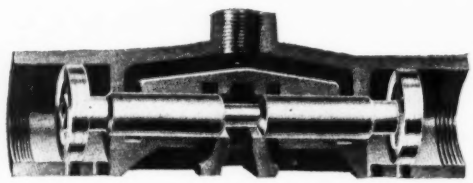
This valve consists of one moving part, having no auxiliary, tappets, or levers and is of a piston-balanced type and is made of high-grade phosphor bronze and placed within a cast-iron steam chest properly machined



The American Steam Pump Co's. Marsh Pump.

and ground to fit, the valve proper being fitted with improved cast-iron expansion packing rings. The main advantage of this type of valve is in its simplicity, ease of access and the fact that it requires no adjustment whatever, and reduces the wearing parts of the steam mechanism to a minimum.

The governing element of the valve is the enlarged heads which present differential areas to the action of the steam. The inner area of the valve-head is reduced by an amount equal to the cross-sectional area of the valve-body and is acted upon by the live-steam pressure, which varies with the annular opening of the valve, due to linear movement. The outer area of the valve head is larger and is acted upon by the pressure which moves the main piston. This main piston is of a hollow type with two main cast-iron expansion rings with steam space in center and when said piston reaches the end of the stroke, one or the other of the main packing rings uncovers an independent port, allowing the live steam to pass up back of the enlarged head of the piston-valve. This can only occur at the end of the stroke and is positive in actuation and regulation. Live steam is maintained within the double piston in cylinder through an independent port at all times as long as the throttle is open. The governing element is that by the action of the valve



The Governing Element of the Marsh Pump.

itself due to the linear movement steam pressure is varied in the main steam cylinder, the area of the main steam port is varied due to the load on the pump, and if there is a light load the portage is automatically reduced and the action is reversed with a full load. Thus the amount of steam delivered to the steam cylinder is in proportion to the load on water end and is a very important feature.

The steam valve does not require setting and it has no "dead" center, and will always start when steam is admitted if pump is in proper condition.

Space will not permit more complete explanation of the main parts of this pump, but the manufacturers would be most pleased to mail complete catalogs to those interested.

It is claimed that there are are over 50,000 Marsh vacuum pumps in operation on vacuum-heating systems of various kinds, installed in some of the most important institutions in the country.

THE "THERMO-CONTROL" VALVE.

We illustrate herewith the "Thermo-Control" valve manufactured by the Consolidated Engineering Co., Jackson and Canal streets, Chicago. This is the heart of the company's system of steam-heating. In Fig. 1 will be

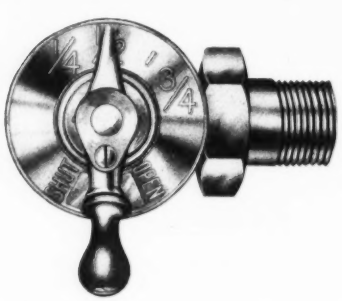
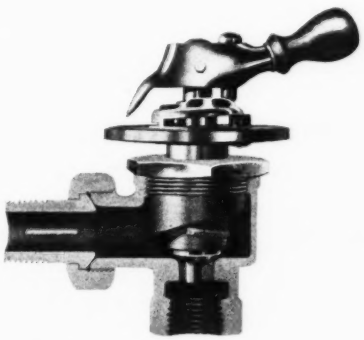


Fig. 1.—Thermo-Control Valve Showing Dial.

noted the valve-adjustment. When the pointer is set at one-quarter, only one-quarter of the radiator receives the steam, and other adjustments up to the "open" point give similar graduations of heat supply. The control is placed near the top of the radiator, which is advantageous because it is so easily accessible. Fig. 2 shows a sectional view

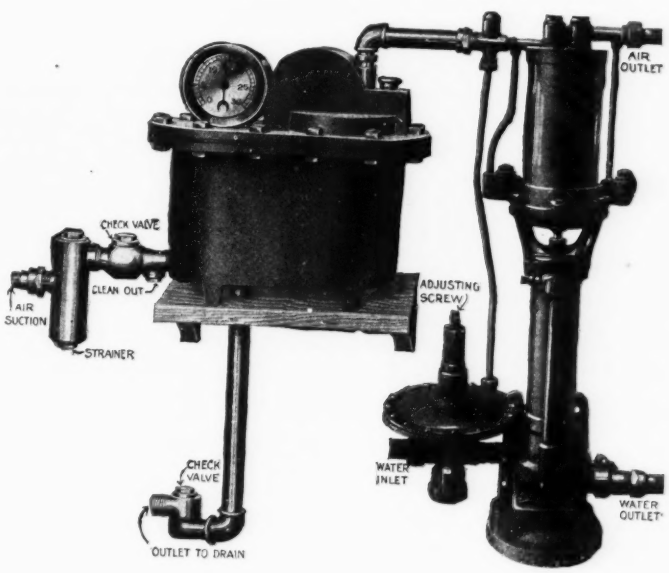
which will easily explain the method of obtaining the graduation of control. The "Thermo-Control" valve is used in connection with a two-pipe system of steam-heating, the water of condensation being returned to the boiler by gravity. The manufacturers claim that complete circulation can be obtained with a pressure of one pound in the boiler. Any standard low-pressure steam-heating boiler can be used in connection with the system, which is equally applicable to exhaust steam.



Thermo Control Valve, Sectional View.

THE "RELIABLE" VACUUM-PUMP.

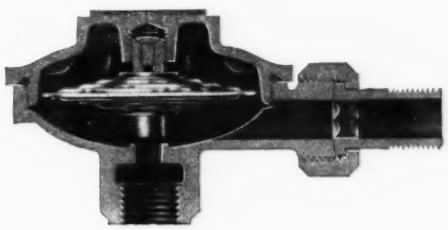
Our illustration shows a "Reliable" automatic hydraulic vacuum-pump, manufactured by the Bishop-Babcock-Becker Co., Cleveland, O. It is only one of the different types of pumps manufactured by the company for various uses. These are made of different sizes and capacities, according to the magnitude of the heating jobs. An air-line condenser has been added to the "Reliable" vacuum-pump, to assist it in operating at its maximum efficiency as an air-exhauster. Any steam escaping through leaking air-valves is condensed. All drip through the air-line is trapped and automatically discharged to the sewer, without breaking the vacuum in the system. The condenser acts also as a filter, which prevents rust, grit, or particles of any sort being drawn into the pumps, causing different seating of the valves or injury to the packing. The "Reliable" pump is connected to the ordinary single-pipe heating-system by means of the air-line. In operation, the manufacturers claim an immediate heating of every radiator; heat-control according to outside temperature and a considerable reduction in fuel-expense. Special literature containing specifications for the installation of the apparatus is issued to all inquirers.



"Reliable" Automatic Hydraulic Vacuum Pump with Air-Line Condenser.

THE DUNHAM RADIATOR TRAP.

The Dunham radiator trap for use on the return end of radiators in two-pipe vacuum steam heating systems is conspicuous for its simplicity. It contains no sliding contacts, and a unique feature about it is that it performs its function of closing tight against steam and opening wide for water and air with a movement of its one movable part—the disc—of slightly less than one-eighth of an inch.



The Dunham Radiator Trap.

The trap has five specific functions: 1st. To open for water to allow the water of condensation to get out of the radiator to which it is attached. 2d. To open for air to allow the air to pass out of the radiator. 3d. To close for steam, to keep all the steam in the radiator 4th. To keep free from clogging. 5th. To not wear out.

In operation as shown in the sectional cut, the corrugated metal disc seen suspended from the cover casting contains a combination of volatile fluids which responds quickly to changes in temperature. Steam surrounding this disc converts the volatile fluids into a gas. In expansion this gas exerts a pressure within the disc that causes it to bulge and forces the valve down to the seat. Water and air following at a lower temperature cause the gases previously formed by the steam to condense, the disc immediately collapses and the trap opens. The water and air immediately are sucked into the re-

turn line. Subsequent steam following the flow of water and air surrounds the disc again, the gases respond, and the trap closes.

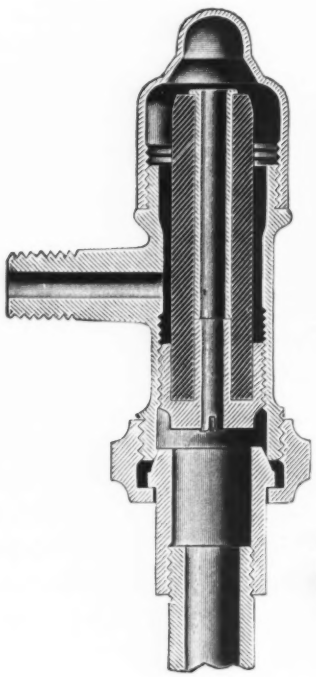
To provide against clogging up the makers have eliminated all sliding contacts, and have used a liquid in the disc which according to tests conducted in the laboratory of one of the most eminent heating engineers in this country, produces a motive force equivalent to 14 lb. at the valve. With no sliding contacts, a large 3/8-in. valve-opening and a motive force of 14 lb., the makers claim that their valve will not clog up when grease and dirt gets into it.

The absolute closing of the trap for steam means that a vacuum is produced by the vacuum-pump clear up to the valve of the trap. The minute the trap opens the water of condensation and air in the radiator is drawn through the trap's opening at a high velocity. This velocity of flow tends to wash the dirt into the return line, where it gravitates down and is collected in the dirt strainer near the vacuum pump.

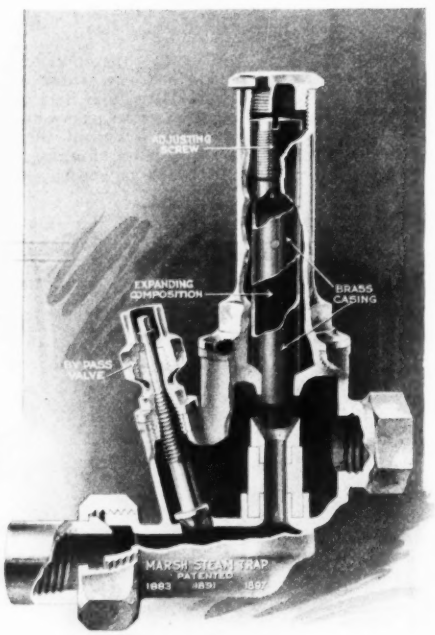
The trap is made of the highest grade of steam metal and is thoroughly tested at the factory of the manufacturers, the C. A. Dunham Co., Marshalltown, Ia., before sending out.

THE MARSH VALVES.

The Marsh valve, manufactured by Jas. P. Marsh & Co., 321-323 W. Washington St., Chicago, is applicable to the several different systems of vacuum-heating constructed with return air-line. It is manufactured with top and bottom adjustment as well as in the sealed-adjustment pattern.



Marsh Sectional View.



The Marsh Thermostatic Valve.

The construction in the sectional view shows that the passage for the escape of air is through the center of the tubular expanding member to the drain-pipe. This air-passage is closed when steam reaches the valve by the expanding member seating on the spring brass cap at the top of the valve, thus forming an improved spring seat which is an important feature of this valve. The large air-opening quickly allows air to be expelled from radiator. The expanding member is lined with a brass tube which holds the post absolutely straight, thus securing a perfect seat and prevents any injury to the valve from high pressure while it works equally well at atmospheric pressure.

This valve has a great range of adjustment and cannot be tampered with on account of the adjusting screw being concealed in the union.

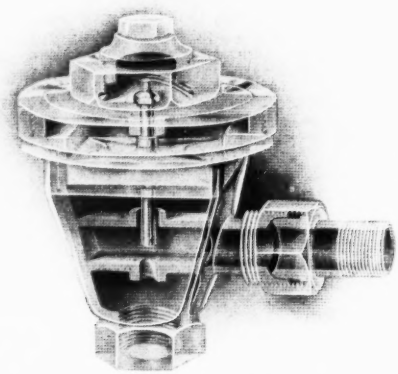
The Marsh thermostatic valve is a double-expanding thermostatic valve, there being two expanding members, the seat being formed on the lower one, which has a large opening and is located opposite the supply or inlet connection. The upper member is constructed to retain its expansion until all the water has been removed. The expanding member is re-inforced with a heavy brass inner tube as well as by an outer brass jacket.

This trap being connected by the inlet to the pipe, radiator or apparatus to be drained at the spot where the condensation accumulates, the valve will allow the water to flow out and will close at the temperature at which steam appears.

THE "KINEALY" THERMAL-VALVE.

The "Kinealy" thermal-valve is designed to be used in connection with the "Kinealy" vacuum or vapor-system of heating, but it may be used on pressure systems just as well. It acts equally well for all pressures in the radiator.

The "Kinealy" thermal-valve consists of a shell of substantially square cross-section, having an inlet piece by which it is connected to the radiator, and an outlet piece by which it is connected to the return pipe. Inside of the shell there is a bellows of a special design, made of two metal diaphragms, of a non-corrosive metal, which contains a volatile liquid, vaporizing at a certain temperature. The vaporizing causes the bellows to expand and operate a valve-piece which controls the flow of air and water from the radiator into the return-pipe. The air and water may pass from the radiator through the same or different orifices but their flow is controlled by the action of the bellows.



The Kinealy Thermal Valve.

The valve is manufactured by the Kaufman Heating & Engineering Co., St. Louis, Mo.

THE RIGHT KIND OF KNOCK.

Opportunity knocked once at the man's door.

To the surprise of Opportunity the man appeared and said:

"I don't want any mining stock, and I don't want to invest in any bamboo plantations, and I don't want to buy a sand plant in Arizona, and I don't want any Belgian hares or squab farms, or mushroom cellars, or ——."

"But, my dear sir," Opportunity interrupted, "I do not bring you any such offers. I am only here to show the way to rivet yourself to the good job you are now holding."

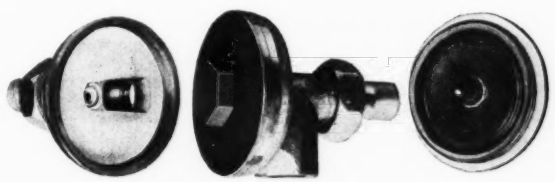
Whereupon the man invited Opportunity in.

Louisville, O.—The Falls City Plumbing Supply Co., has been incorporated with a capital of $125,000. Incorporators: J. A. Hillerich, F. W. Bradsby and Wm. F. Gossling.

THE ILLINOIS THERMO-VACUUM VALVE.

The Illinois Engineering Co., Chicago, well known in its successful marketing of its float-type vacuum-valve, is now putting out a thermo-vacuum-valve where thermostatic valves are preferred. This valve is small and compact and consists of a diaphragm which controls the valve-seat, The diaphragm is mounted vertically, and controls the inlet to the valve, thus placing the diaphragm on the opposite side of the valve-seat from the radiator. Thus the diaphragm is in the return pipe and is controlled by the temperature therein and not by the temperature in the base of the radiator, which is the case where the diaphragm controls the outlet from the valve.

This construction, the manufacturers claim, makes the diaphragm more sensitive and avoids the accumulation



The Illinois Thermo-Vacuum Valve.

of water in the base of the radiator, which occurs where the diaphragm is operated by the radiator-temperature.

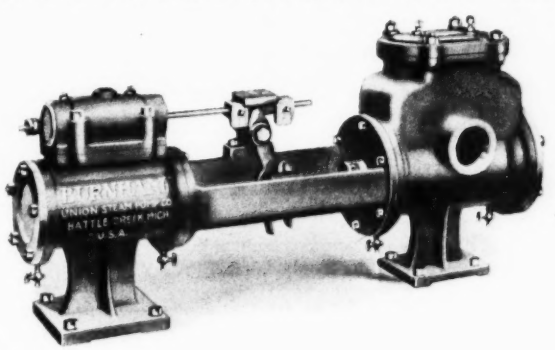
Many inlet-control valves have proved unsuccessful by reason of the varying vacuum-pull on the diaphragms.

After considerable experimental work, the Illinois thermo-valve has been developed so as to operate successfully under all these conditions. While the valve is absolutely tight against the passage of steam, it opens on such a slight drop in temperature that water does not accumulate in the radiator. Another feature to which the makers draw special attention is that the valve-seat in the inlet is directly over the outlet, so that any dirt passing the valve-seat will drop directly into the return pipe and not accumulate in the valve.

The diaphragm is made with concave sides instead of the usual convex sides, a slight internal pressure expanding the diaphragm, it being maintained that this construction makes the diaphragm more sensitive while subjecting it to less internal pressure.

THE BURNHAM VACUUM PUMP.

The Union Steam Pump Co., Battle Creek, Mich., manufactures low-vacuum pumps, intended for use at a vacuum of 25 in. or less, and adapted for handling condensation



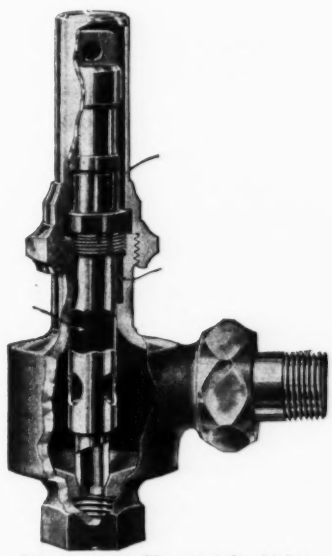
The Burnham Vacuum Pump.

of vacuum-heating systems. These pumps are fitted with bronze piston-rods, valve-seats, bolts and springs, and linings. Pumps with steam cylinders of 8½ in. or smaller have cast-iron yokes, while the larger size pumps have yokes built up of two cast-iron cylinder heads and polished steel tie-rods. Sixteen-inch air cylinders are equipped with hand-plates, so that the pump valves may be accessible. The new catalog issued by the company shows a special 1911 design of low-vacuum pumps, which has been found particularly adaptable to heating systems. In this all the valves can be removed through the cover-plate on top of the cylinder, and it can be done without disturbing any piping.

NATIONAL THERMOSTATIC VALVE.

The accompanying illustration shows a sectional view of the National improved thermostatic valve. It is used on vacuum-systems, radiators, heating-coils, dry-kilns, drips from risers, etc. Its operation is effected by a composition encased in a brass tubing. The use of the tubing is to secure a perfect seating, and to prevent buckling or deformation due to expansion or over-adjustment. The adjustment is not made by means of a screw, but carbon is held in place by spring-friction.

The expansion member consists of a composition so delicate that it responds readily to a difference of a few



The National Thermostatic Valve.

degrees in temperature. It is packed with a ring-packing, preventing leakage. The trap is self-adjusting, and for high-pressure work it is furnished with a screw attachment and spring lock-nut, so that the stem can be removed and replaced without necessitating a change of adjustment. The manufacturers claim that one of the chief features of this device is the simplicity of construction. It consists of only two parts, the expansion-post and the body, there being no small openings to clog up and no small parts to get out of order. The valve operates at any pressure from temperature to 30 lb., and can be used with live or exhaust steam. In vacuum-systems, the National thermostatic valve is attached to the base of each radiator, connected by return-pipe to the vacuum-pump. It is manufactured by the National Steam Specialty Co., 8-10 S. Clinton St., Chicago.

WHO MAKES O. S. DISTRIBUTORS?

A correspondent asks for the name of the manufacturer of the O. S. Distributors. We do not find them listed anywhere. Will one of our readers supply this information?

EASY ACCOUNTING.

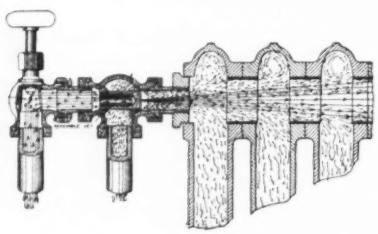
Boss: There's $10 gone from my cash drawer, Johnny; you and I were the only people who had the keys to that drawer.

Office Boy: Well, s'pose we each pay $5 and say no more about it?—Philadelphia Bulletin.

THE MOLINE VACUUM-VAPOR HEATING DEVICE.

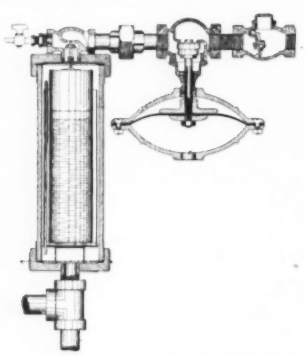
The Moline Vacuum Vapor Heating Co., Moline, Ill., supplies to the trade three devices which are well worthy consideration—an ejector, condenser and air-trap. The air from the Moline vapor-heating system is removed by these three in combined action. The ejector is really a steam-jet pump without moving or working parts. It is set at the end of the main steam-pipe, and when the system is heated up, the ejector provides a generous opening at the end of the steam-main from which the air flows out without friction. The air is immediately followed by steam with a velocity of 800 ft. per second. The result is a suction or pull on the air-line, dropping the pressure in return-line and promoting flow of vapor to all radiators.

The condenser condenses the steam from the ejector, utilizing the steam's heat. It also stores the air that



The Moline Ejector and Condenser.

leaks into the piping and radiators during the vacuum periods or loss when the pressure in the system is less than atmospheric. This air remains in the condenser until enough pressure is raised for its expulsion through the air-trap. The function of the air-trap is to discharge the air from the piping and radiators without friction, and to prevent the escape of steam. It is simply a big heat-valve, whose operating principle is the expansion and contraction of a small quantity of air condensed in an open-bottomed float; in fact, the only opening on the system is on the air-trap, which is usually installed



The Moline Air-Trap.

at the basement ceiling. Complete and extended description of the action of these various features is given in the literature of the manufacturers. An examination of the illustrations will reveal the operative functions of these devices.

THE McDONALD AUTOMATIC TEMPERATURE CONTROL.

The McDonald automatic temperature control, herewith illustrated, is manufactured by the McDonald Vacuum & Vapor Specialty Co., Cleveland, O. Fig. 1 shows how the control supplies a radiator, one loop of which is given, the control consisting of an automatic air-valve with a fluid diaphragm, adapted to be set to work in a range of 40 to 80 deg. Fig. 2 illustrates the radiator partially filled and controlled by a fluid diaphragm holding the steam at 72 deg. and working at a range of 2 deg. from the point set on the figure-dial. These valves are extremely sensitive to slight changes of temperature, and the control-device is applicable to all radiators, giving perfect control to all the system, or can be applied to a single radiator. The McDonald automatic temperature control is used in connection with air-line systems or regular one or two-

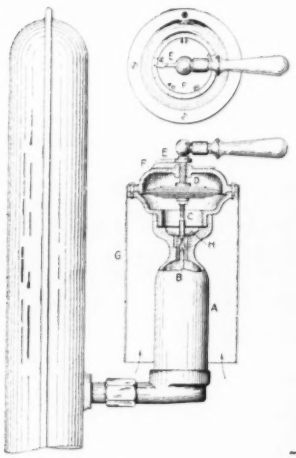


Fig. 1.

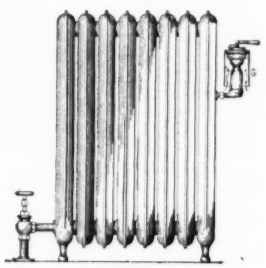


Fig. 2.

pipe gravity systems. They are used in combination with a special hydraulic-exhaust apparatus, and a hydraulic-driven pump, particularly adaptable where water-pressure is low. The air-lines from the radiators lead to the exhausting apparatus. Complete illustrated folder of the McDonald devices is sent out by the manufacturers, which clearly presents their intimate relationship and operative efficiencies.

NEW $500,000 FACTORY FOR COLUMBUS, O., DUE TO WOMAN'S IDEA.

The Fire Retainer Heating Co., of Columbus, O., has been incorporated with a capital of $500,000 to locate a factory in Columbus to manufacture a patented heater which it is claimed will revolutionize the present systems of heating. The stove, which burns either wood or coal, is the invention of a Portland, Ore., woman, who while camping out discovered the principle upon which the new heater is constructed. After working on the idea for several years she evolved the present stove.

Several days ago Pres. Fred W. Herbst of the Columbus Chamber of Commerce appointed a commission, with Prof. C. P. Crowe, of the Ohio State University, as chairman, to make a 15-hour test of the stove. The report shows that 14 lb. of coal were consumed in the range submitted by the company, maintaining for 14½ hours an average oven temperature of at least 100 deg. hotter than is necessary for baking. It is claimed that the invention will utilize from 80 to 85 per cent. of the fuel energy consumed. Considerable Columbus capital has been interested in the project.

THE MODERN WAY.

"Will you allow me to ask you a question?" interrupted a man in the audience.

"Certainly, sir," said the lecturer.

"You have given us a lot of figures about immigration, increase of wealth, the growth of trusts, and all that," said the man. "Let's see what you know about figures yourself. How do you find the greatest common divisor?"

Slowly and deliberately the orator took a glass of water. Then he pointed his finger straight at the questioner. Lightning flashed from his eyes, and he replied, in a voice that made the gas jets quiver:

"Advertise for it, you ignoramus!"

The audience cheered and yelled and stamped, and the wretched man who had asked the question crawled out of the hall a total wreck.—Tit-Bits.

THE SPARKS VACUUM PUMP.

The Sparks vacuum-pump herewith described and illustrated is used in connection with the Sparks system of positive steam-circulation. It is absolutely automatic in its operation and is suitable and equally adaptable to all classes of buildings and plants.

The Sparks pump is built in a number of sizes, varying in accordance with the amount of radiation to which it is applied. Its valve-mechanism is of the most ingenious construction, arranged so that it is absolutely automatic, starting and stopping when needed. There are no parts of the pump or mechanism that require oiling or attention. If the connections to the pump are made properly it has been found to operate satisfactorily with the minimum of cars. The large capacity of the pump

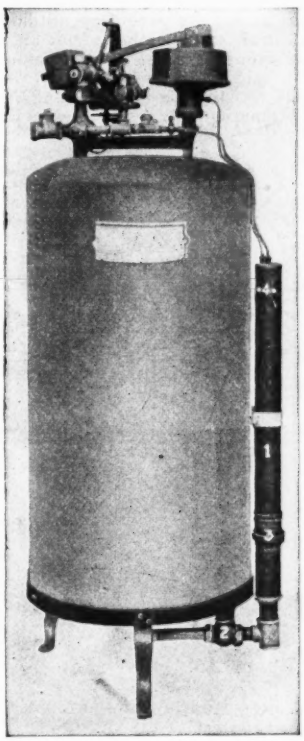


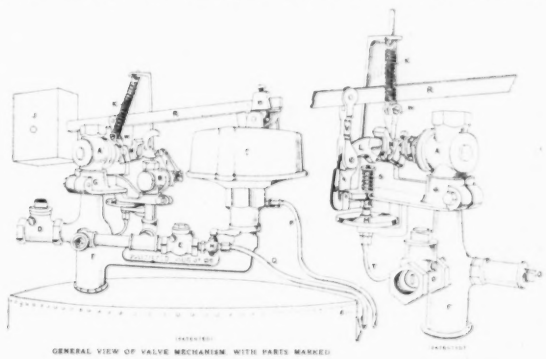
Fig. 1.

for removing air and producing a vacuum, affording ample reserve, is worthy of notice. This feature is very desirable when starting up the heating plant.

The manufacturers claim that this pump will maintain a vacuum on low pressure heating systems including boilers or on the exhaust or heating mains of a high-pressure plant continuously without cost or aid of outside power.

The completed pump is shown in Fig. 1, the operating mechanism in Fig. 2, and the detail of the locking arrangement in Fig. 3, and by referring to these three illustrations the following describes the operation of the pump:

"Vapor enters tank and thermostat (1) through valve (A). The expansion of the volatile liquid in thermostat operates the lever (R) by means of bellows diaphragm (C) closing supply-valve (A) and opening water-valve (B) admitting a water-spray to tank and thermostat thereby producing a vacuum and at the same time causing the volatile liquid in thermostat to contract allowing lever (R) to close water-valve (B). When the vacuum created is not sufficient, lever (R) will continue to drop, compressing spring (K) until it passes center, then supply-valve (A) will again open and the action above-described is repeated. When all of the air in the system is exhausted the intensity of the vacuum in the tank op-



GENERAL VIEW OF VALVE MECHANISM, WITH PARTS MARKED.

Fig. 2. Fig. 3.

erating on the spun-copper diaphragm (M) locks the valve-mechanism with all valves closed, until the vacuum drops to the minimum point at which the pump is adjusted and just as soon as this point is reached the action of the pump is again repeated."

The fourteen distinctive features of the Sparks system are embodied in careful detail in the new catalog of the Iroquois Engineering Co., Chicago, the distributors of the system, the Automatic Vacuum Pump Co., being the manufacturer and patentee.

A "DOMESTIC ENGINEERING" READING CIRCLE.

Carey & Hall, 604 Clinton St., Defiance, O., are sanitary and heating engineers. They assure their customers that they will give them installations of the protective type and satisfactory kind. In a recent letter to "Domestic Engineering," the following pleasing statement appears: "At the present time you may note that there are seven readers of 'Domestic Engineering' in our organization." Seven always was a lucky number. Other plumbing shops please copy.

STONE BATHTUBS USED.

On the great private estates in Mexico, baths are in use today which were hewn out of the solid rock centuries ago by slave labor. They are located, for the most part, in the vicinity of running water and are fed by bamboo pipes, but in many cases they have to be filled by the old-fashioned method of carrying a bucket to and from the spring.

In the cities the so-called stone baths are made of cement. The residences of the well-to-to people are provided with them and they are a feature of the native hotels. They are usually about 10 feet long and 4 feet deep—baby swimming tanks, in fact.

The tropical custom is to fill the baths late at night. By the following morning the water will have acquired a limpid coolness that acts like a tonic upon the body. When one remembers that near the equator it is almost as warm in the morning as it is at noon and that water taken direct from the city mains is always tepid, the advantage of the stone or cement bath is evident.

Kansas City, Mo.—The building committee of the board of education has awarded the contract for the heating apparatus in the new addition to the Ashland school to Lewis & Kitchen, for $3,935. The plumbing is to be installed by Joergens Bros. at a cost of $1,759. C. Y. Roop will supply oil-burners for $756.

NEW ENGLAND NOTES.

Massachusetts.

Boston—Acting Mayor Collins has approved a contract with Laskey & McMurrer for installing a system of heating and ventilating in the new Aquarium building at City Point, South Boston. Bids of this work were as follows: Laskey & McMurrer, $15,887; L. W. Taylor Co., $17,283; J. J. Hurley, $20,540; Pierce & Cox, $22,195; Ingalls & Kendricken, $24,240; William H. Gallison Co., $24,590; Lynch & Woodward, $19,870; James P. Dwyer, $18,647; A. B. Franklin, $21,615.

South Framingham—Fitz & Barker, of Natick, have been awarded the contract for plumbing in the Baptist church.

Chelsea—The Chelsea Board of Control has invited proposals for installing a heating and ventilating plant in the new school building on Central avenue. Bids will be received until 2.30 p. m., Tuesday, August 8th, at the office of the board of control.

South Framingham—William B. Frost is enlarging the heating plant, installing new bath-rooms and doing other work at the Winthrop hotel.

Marlboro—The school committee has awarded the contract for plumbing, in connection with changes which are being made at the Pleasant sctreet school building, to Patrick Fahey.

Leominster—A movement is on foot for the adoption of a set of plumbing rules and regulations, led by Henry N. Spring, a new member of the board of health. The town has been without plumbing laws for the past four years, the old laws having been declared illegal at that time. Mr. Spring was inspector of plumbing for 11 years under the old regulations.

Amherst—The extension of the water mains to South Amherst has enabled the selectmen to introduce running water at the town poor-farm and a bath-room is to be installed for the use of the inmates. The contract has been awarded to the Mutual Plumbing & Heating Co.

Milford—Milford's new plumbing regulations are acceptable to Attorney General J. M. Swift and they will be put in force at once. One of the first acts of the board of health will be the appointment of an inspector of plumbing. J. E. Higgiston is the most prominent candidate for the new office.

Newburyport—The contract for plumbing the new shoe factory which is being erected on Merrimac street by the Newburyport Building Association for the G. A. Learned Co., has been awarded to the Hub Plumbing & Heating Co. The contract is an important one and includes connections with the city main and the installation of a large number of fixtures. The water for use in the building will be taken from the Merrimac street main by a 6-inch pipe with valve shutoff.

Chelsea—Inspector of Plumbing Frank E. Winslow is back on the job again after spending his annual vacation at Carter's Point, N. B.

Maine.

Portland—A new schedule of prices is being considered by the master plumbers of the state to go into effect, it is expected in the late summer or early fall. The prices will be in conformity with those charged in Massachusetts and elsewhere.

Connecticut.

Bristol—Napoleon Breault is erecting a new house for himself on Orchard street and has let the contract for plumbing to J. M. White & Co.

New Haven—The Coe & Coleman Co., will do the plumbing in connection with the changes which are to be made to the building at 108 Court St. for Wallace B. Fenn.

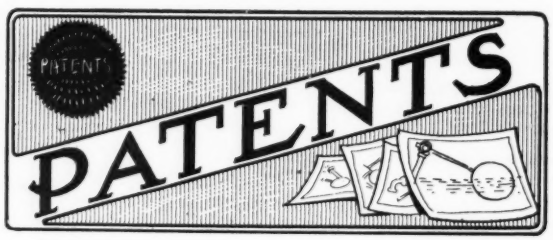
New Hampshire.

Franklin—Louis J. Cherrier has taken the contract to install a ventilating system in the new school-house at Alton.

Vermont.

Middlebury—New plumbing and steam heating arrangements are to be put in the old Catholic church building, which has recently been acquired by Middlebury College and which is to be used as a gymnasium. The contract has been placed with Joseph Calhoun.

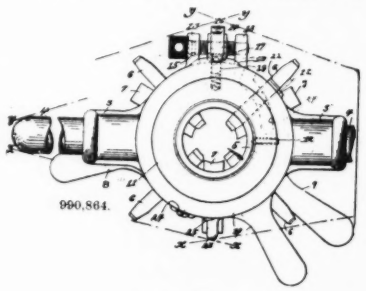
Wichita, Kans.—The Master Plumbers' Association held an all-day basket-picnic at Hellar's Grove on July 22d. Nearly all the members of the association, with their families, enjoyed a delightful day's outing.

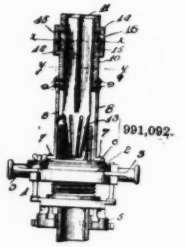


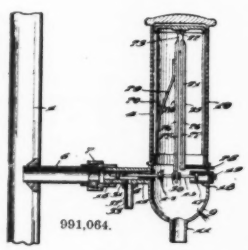
Heating Department.

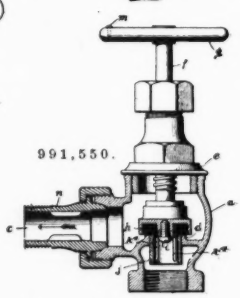
990,864 Die-Stock. Louis F. Hart, Cleveland, O., assignor to The Hart Manufacturing Co., Cleveland, O., a corporation of Ohio. In mechanism of the character described, the combination of a body member; dies movable in said member; a cam-plate rotatably secured to said member and adapted to position said dies therein, said cam-plate having its periphery notched; a screw rotatably mounted on said member about an axis transverse to that of said cam-plate; and a catch having threaded engagement with said screw and adapted to engage a notch in said cam-plate to secure the latter against rotation.

991,064. Automatic Valve for Steam and Hot-Water





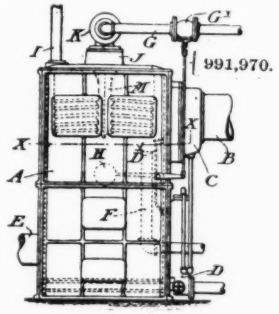




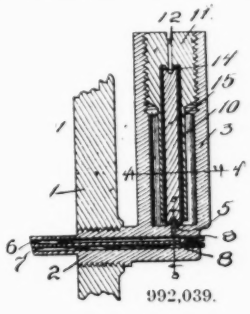
Radiators. Walter Houser, Summithill, Pa. In a device of the character described, the combination with a hollow base having a tubular extension thereon, of a removable seat in said tube, a valve adapted to engage the seat, a rod secured to the valve, a guide on said rod movable in the tube, a disk on said rod, a tubular guide in said base into which said disk projects, a removable plug in the end of said tube, a screw-threaded opening in said first-mentioned tube, a depending tubular receptacle secured in said opening, a casing on said base, a thermostatic fork in said casing comprising two bars secured together, each bar consisting of two strips of different metals secured together, one strip of one bar having a bifurcated end and straddling the rod, shoulders on said rod at the opposite side of said strip, a set screw engaging one of said bars, and a spring engaging the other of said bars, substantially as described.

991,092. Reaming Attachment for Die-Stocks. Francis Saville, Chicago, Ill. The combination with a pipe-threading die-stock of a tubular member mounted upon said die-stock in axial alinement therewith, the said tubular member being formed of two separate portions secured together by side yokes and each of said portions being provided with an opening polygonal in cross section; a reamer having a threaded shank fitting said opening and slidable therein; and a nut mounted in the space between said tubular member portions and engaging said shank, substantially as described.

991,550. Radiator-Valve and Attachment therefor. John A. Serrell, North Plainfield, N. J., assignor to Warren Webster & Co., Camden, N. J., a corporation of New Jersey. A valve consisting of a body having an inlet and outlet, a thoroughfare and a seat about said thoroughfare, the main valve-piece adapted to fit upon the seat and close the thoroughfare, the stem for operating said valve-piece, the auxiliary valve-piece consisting of a hollow piston having elongated openings in its side walls extending at the top to the contact surface of the main valve-piece, said piston being secured to the bottom of the main valve-piece and extending through the thoroughfare and adapted



991,970.



992,039.

to afford a small variable passageway between the inlet and outlet when the main valve-piece is raised, and means for detachably securing said auxiliary valve-piece to the main valve-piece.

991,970. Water-Heater. Joseph W. Gamble, Philadelphia, Pa., assignor to Joseph S. Lovering Wharton, William S. Hallowell, and John C. Jones, Philadelphia, Pa., doing business as the firm of Harrison Safety Boiler Works, Philadelphia, Pa. In a water-heater of the kind specified the combination with the heating chamber and the steam-supply and hot-water discharge connections therefor of one or more sets of inclined trays located in said chamber above the water level therein with the trays in each set aranged one above another and similarly inclined and each discharging at its lower end and means for supplying the water to be heated including provisions for distributing the water between and discharging it upon the various trays at their upper edges.

992,039. Radiator Air-Valve. Arthur O'Brien, Butte, Mont., assignor of one-half to Alf C. Kremer and William M. Kirkpatrick, Butte, Mont. A thermally operated valve embracing a stem having a chamber at one end and a plurality of passages extending from the opposite end of the stem to the chamber, means for varying the size of the chamber, a barrel integral with said stem and having an inlet aperture from one of the passages, an adjustable head or plug in the barrel having an outlet aperture, a seat provided at the inner end of each aperture, an expansion rod loosely supported between said seats to close both apertures when expanded by heat, and to close the lower aperture when cold.

Plumbing Department.

990,989. Fire-Hydrant. John Knickerbacker, Troy, N. Y., assignor to Eddy Valve Co., Waterford, N. Y., a corporation of New York. A hydrant comprising a stand-pipe, a main valve to control admission thereto, a dash-pot carried by said main valve, an auxiliary valve connected with said dash-pot and having a seating surface to further control admission to said stand-pipe and a portion on said auxiliary valve arranged to substantially check admission before said seating surface becomes effective.

990,990. Fire-Hydrant. John Knickerbacker, Troy, N. Y., assignor to Eddy Valve Co., Waterford, N. Y., a corporation of New York.

991,123. Trap for Waste-Water Pipes. William R. Willetts, Waterbury, Conn., assignor to American Pin Co., Waterbury, Conn., a corporation of Connecticut. An S-shaped water-trap comprising lower and upper shallow units of equal size and oblong shape, the upper unit being inverted; each of the units being formed with corresponding end openings in the same plane and annular

CAPITOL FOOT REST

The Capitol Foot Rest

Just what the cut illustrates.

An attractive convenient rest for chilled or damp feet. Strong in construction, neat in design, can be fastened to any cast iron radiator. In addition to the position illustrated shelf may be raised to horizontal position and used as a plate warmer, or lowered flat against the radiator.

Every owner would like one or more of these foot rests for they add to the comfort and are inexpensive.

Lay in a small stock, put one in your window, show it to your customers, and see how quickly they sell.

Now is the time to start with this Sterling Specialty. Sell it to your old customers.

PRICES ON REQUEST

UNITED STATES RADIATOR CORPORATION

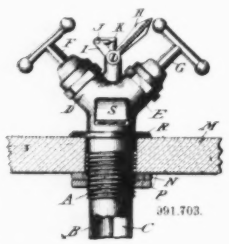
General Offices, Detroit, Michigan
Branches in Principal Cities

MAKERS OF UNITED STATES BOILERS, RADIATORS AND SUPPLIES

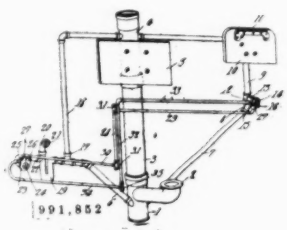
flanges similar in size to and surrounding the end openings; both units being interchangeable, and changeable end for end, and a union coupling the inner flanges of the units together.

991,142. Fitting for Plumbing Systems. Henry L. Erck, Canton, O. The herein described fitting for plumbing systems consisting of the combination of a reducible elbow, an integral head, said head constituting a soil and vent-pipe, said elbow portion located between the ends of the vent and soil-pipe portions of the head and provided with screw threaded apertures in the walls thereof, the walls of said apertures inclined toward the soil-pipe portion of the head and the vent-pipe provided with apertures, said apertures located above the horizontal portion of the elbow, substantially as and for the purpose specified.

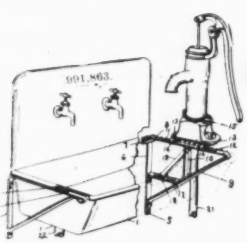
991,559. Fire-Hydrant. William H. Symons, San Diego, Cal. In a fire-hydrant, a stand-pipe, a funnel-shaped nozzle base extending outwardly from the stand-pipe with its small end outwardly; said small end being internally screw-threaded, a nozzle bushing-screw seated in the nozzle base and having an external screw-thread on its



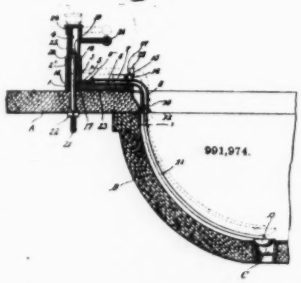
991,703.



991,852



991,863.



991,974.

outer end to receive a hose coupling and having a valve seat upon its inner end, and there being an opening through the opposite side of the stand-pipe in alinement with the opening through the bushing; the surface around the inner end of the opening being finished to form a tight joint, and the surface around the outer end of the opening being finished to receive a lock nut, a valve frame mounted in said alined opening and adapted to form a tight joint with said inner finished base and having an external screw-thread on its outer end and a lock nut on said external screw-thread so that by removing the bushing and removing the lock nut the valve frame may be removed through the bushing opening.

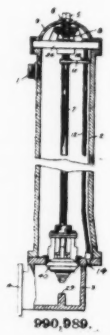
991,703. Basin and Bath Supply Fitting. Raymond E. Crane and Oscar J. Backus, Newark, N. J. The combination with a slab, of a Y-shaped basin or bath supply fixture comprising a hollow upright post or standard having a base resting on the slab, supply channels for the hot and cold water passing through the slab under said base and into said post or standard, and valves to control said supply channels and having stems extending upward and outward from said post or standard and constituting the upper arms or branches of the Y.

991,708. Pump. Johan Sigismund Fasting, Frederiksberg, near Copenhagen, Denmark.

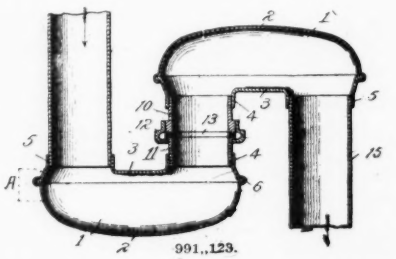
991,784. Valve. Edward J. Kiley, Philadelphia, Pa., asignor to Nelson Valve Co., a corporation of Pennsylvania. In a valve having a seat, the combination with a valve disk having a plane-face arranged to engage said seat, and provided with a boss forming a spherical segment and a threaded stud in unitary relation therewith, of a hanger having an aperture for said stud of substantially larger diameter than said stud, surrounded by a concavo-convex portion whose opposite surfaces are concentric with said boss and one of which forms a socket for said boss, and a nut in threaded engagement with said stud, having a concave surface engaging said convex surface and loosely retaining said boss in said socket.

991,852. Plumbing System. William Keller, Cleveland, O. As an article of manufacture, a combined double Y and T fitting having a bend provided with a bowl-flange, a waste-pipe extending from said fitting, a cross-fitting on said pipe for attachment to a stack, unions for attachment respectively to a lavatory and a tub, waste-pipes extending from said unions to the double Y fitting, and vent pipes extending from said unions to the cross-fitting.

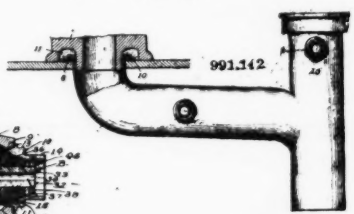
991,863. Sink and Pump Support. Herbert H. Macomber, Kendallville, Ind., assignor to Flint & Walling Manufacturing Co., Kendallville, Ind., a corporation of Indiana. The combination with a supporting bracket, of a pump provided with a base having an upstanding cylinder-engaging portion and an outwardly extending flange from which the upstanding portion rises, a pair of bolts each coacting between the pump-base flange and the bracket, a laterally extending adjustable brace carried by



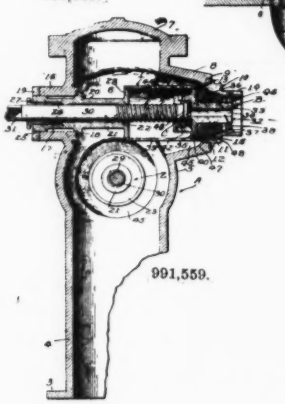
990,989.



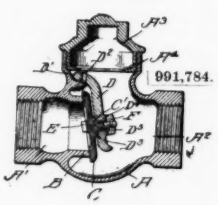
991,123.



991,142



991,559.



991,784.

the bracket and directly engaging the pump-base flange, and a third bolt coacting between the pump-base flange and brace.

991,974. Plug-Operated Means for Wash-basins or the Like. Harry A. Grant, Boston, Mass. Plug-controlling means for wash-basins or the like comprising a member mounted on the basin and provided with a vertically disposed guide-member, a hollow vertically adjustable plug-carrier extending into the guide-member, an attaching member extending through the plug-carrier and through the basin and provided within the plug-carrier with a shoulder, the lower end of the carrier being formed to provide a head, a spring confined between the head and shoulder respectively, and a plug supported by the said carrier.

Cincinnati, O.—At a recent meeting of the Cincinnati Master Plumbers' Association at the Builders and Traders' Exchange, the following officers were elected: Louis T. Krouse, president; Ray J. Hillenbrand, vice-president; B. A. Laumann, treasurer; William Kemper, secretary, and Andrew J. Murray, William Attlesey and R. A. Cluxton, directors.